

**Factors Affecting Banks Profitability: An Empirical Study on
Ethiopian Private Commercial Banks**

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DECLARATION

I, Sori Tefera declare that this thesis entitled “*Factors Affecting Bank Profitability: an Empirical Study on Ethiopian Private Commercial Banks*” is outcome of my own effort and that all sources of materials used for the study have been duly acknowledged. I have produced it independently except for the guidance and suggestion of the thesis Advisor.

This study has not been submitted for any degree in this University or any other University. It is offered for the partial fulfillment of the degree of Masters of Science in Accounting and Finance.

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CERTIFICATE

This is to certify that thesis entitled, “*Factors Affecting Bank Profitability: an Empirical Study on Ethiopian Private Commercial Banks*”, undertaken by Sori Tefera for the partial fulfillment of degree of Master of Science in Accounting and Finance at Addis Ababa University, is an original work and not submitted earlier for any degree either at this University or any other University.

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ABSTRACT

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This study examined factors affecting profitability of private commercial banks' in Ethiopia. The study adopted quantitative research approach and the statistical cost accounting model was used to estimate the profitability, which was measured by return on asset as a function of balance sheet, industry specific and macroeconomic explanatory variables. The finding of the study show that loan and advance, current deposit, other liabilities and gross domestic product have statistically significant and positive relationship with banks' profitability. On the other hand, variables like fixed deposit, market concentration have a negative and statistically significant relationship with banks' profitability. However, the relationship of deposit with other banks, sum of investment, saving deposit and inflation is found to be statistically insignificant. As a result, the study recommended that private commercial banks should focus on increasing public awareness to mobilize more savings this will enhance their performance in provision of loans and advance to customers. Finally, private commercial banks should not only be concerned about internal structures and policies, but they must consider both the internal environment and the macroeconomic environment together in fashioning out strategies to improve their profitability.

Key words: Asset Liability Management, Statistical Cost Accounting Model, Profitability

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List of Acronyms

AIB	Awash International Bank
ALM	Asset Liability Management
BOA	Bank of Abyssinia
CLRM	Classical Linear Regression Model
DB	Dashen Bank
GDP	Gross Domestic Product
HHI	Herfindhal index
HP	Hypotheses
INFL	Inflation
MoFED	Ministry of Finance and Economic Development
NBE	National Bank of Ethiopia
NIB	Nib International Bank
OLS	Ordinary Least Square
ROA	Return on Asset
ROE	Return on Equity
RSA	Rate Sensitive Asset
SCA	Statistical Cost Accounting
UB	United Bank
WB	Wegagen Bank

Chapter 1 Introduction

1.1. Background of the study

Banks' profitability is of utmost concern in modern economy. Banks are in a business to receive deposits or liabilities and to issue debt securities on the one hand and create or invest in assets on the other hand (Fama, 1980). Commercial Banks incur costs for their liabilities and earn income from their assets. Thus profitability of banks is directly affected by management of their assets and liabilities. In addition, different market and macroeconomic factors also influence the ability of the banks to make profits (Athanasoglou et al, 2008).

There are many aspects of the performance of banks that can be analyzed. This study focuses on the profitability performance of private commercial banks in Ethiopia using statistical cost accounting model. As noted in Flamini et al. (2009) bank profits provide an important source of equity especially if re-invested into the business. This should lead to safe banks, and as such high profits could promote financial stability. However, too high profitability is not necessarily good. Garcia-Herrero et al. (2009) observed that too high profitability could be indicative of market power, especially by large banks. This may hamper financial intermediation because banks exercising strong market power may offer lower returns on deposit but charge high interest rates on loans. Too low profitability, in turn, might discourage private agents (depositors and shareholders) from conducting banking activities thus resulting in banks failing to attract enough capital to operate. Furthermore, this could imply that only poorly capitalized banks intermediate savings with the corresponding costs for sustainable economic growth.

The banking environment in Ethiopia has, for the past decades, undergone many regulatory and financial reforms like other African countries and the rest of developing world. These

reforms have brought about many structural changes in the banking sector of the country and have also encouraged private banks to enter and expand their operations in the industry (Lelissa 2007). Despite these changes, currently, the banking industry in Ethiopia is characterized by operational inefficiency, little and insufficient competition and perhaps can be distinguished by its market concentration towards the big government owned commercial bank and having undiversified ownership structure (Lelisa 2007). The existence of less efficiency and little & insufficient competition in the country's banking industry is a clear indicator of relatively poor performance of the sector compared to the developed world financial institutions. Thus, it is important to know the determinants of banks profitability for an efficient management of banking operations aimed at ensuring growth in profits and efficiency.

The issue of the factors affecting the profitability of private commercial banks in Ethiopia, using the statistical cost accounting model to the knowledge of the researcher, has not been studied until now. Therefore, this study intended to complete this gap and to provide suggestions for improving profitability of private commercial banks' in Ethiopia.

In the context of the above discussions, the purpose of this study is to assess factors affecting the profitability of private commercial banks in Ethiopia. The remaining discussions in the chapter are arranged in eight sections. Section 1.2 presents the problem statement. Section 1.3 presents objectives of the study. Section 1.4 presents hypotheses of the study. Section 1.5 presents research methodology of the study. Section 1.6 presents the significance of the study. Section 1.7. presents the scope of the study. 1.8 discusses the limitations of the study. Finally, the structure of the study is discussed in section 1.9.

1.2. Statement of the problem

Efficient composition of assets and liabilities of commercial banks is crucial for their sound financial performance. In fact, economic theory suggests that banks attempt to produce to maximize profits while minimizing cost. This means most profitable banks have become efficient banks while maximizing profits (Goldberg and Rai 1996, Berger 1993). As banking firms may attempt to maximize profit by many ways, assets and liability management activities are the most probable methods. In developed countries, a variety of sources and use of funds are available for banks allowing them to diversify asset and liability portfolios. But in developing economy, banks are constrained with low breadth and depth of financial market and as such their asset and liability base are narrower than those of their counterparts in developed countries. For example, banks in developed countries, such as USA and Australia, can invest their excess cash reserve in short-term trading and investment securities unlike Ethiopia where there is no short-term trading securities but limited existence short-term investment securities, such as government bills and bonds. Constrained by the lack of vibrant money market, Ethiopia's private commercial banks have not been able to invest their excess cash reserve for adequate return. Due to the competition in the financial markets, banks seek out greater efficiency in the management of their assets and liabilities.

Accurately evaluating and measuring the performance of commercial banks is not an easy task. Banks differ in their sizes and this could have an effect on responsibilities of management, liquidity, debt level and profitability. A bank's assets and liabilities can affect its valuation in the market, its ability to acquire other banks or to be acquired at a good price. Therefore, a complete picture of the bank, in the form of its financial position, i.e. its balance sheet, should be studied and evaluated to be able to acceptably prediction of its

future performance. The main source of profits generated by a bank is the balance sheet portfolio: the assets, liabilities and capital which are considered important components in determining profits.

Commercial banks are the most dominant financial institutions in Ethiopia. The private sectors involvement started after Monetary and Banking proclamation No.83/1994. The access capital banking sector review for the 2010 fiscal year shows that Ethiopian private commercial banking industry enjoyed high growth, high profits, and high dividends. Even in the midst of a challenging environment, all key areas of banking operations; collecting deposits, providing loans, and foreign exchange dealing showed growth of more than 20 percent. Profits were up 45 percent and shareholders (at banks open for more than a year) received an average return of 27 percent on their investments. Overall deposits collected by private banks rose by more than Birr 8 billion in a single year, from Birr 29.9 billion in June 2009 to 38.3 billion in June 2010. This represents a growth rate of 28 percent, which is not much lower than the average annual deposit growth seen in the past five years (31%).

The aforementioned facts gives a clue to the Ethiopian private commercial banks growth in profits is due to underdeveloped nature of the sector. Therefore, this growth may not continue when the finance sector becomes highly developed and the competition become tough, so investigation of the impact of asset and liability management on profitability of banks is vital. According to the access capital review of 2010 commercial banks surely be challenged by the entry of six new banks (Abay, Enat, Hawassa, Dehub Global, Noah, Zam-Zam), But none of these developments represent a serious blow to the prospects of the existing private banks in their view. [Moreover, still there is a huge](#) and still largely unmet financial intermediation needs in Ethiopia. Therefore, investigation of factors affecting banks profitability using SCA model essential for the new entrants and for the existing banks.

1.3. Objectives of the study

1.3.1. General objective of the study

The general objective of the study is to assess factors affecting bank profitability of private Commercial Banks in Ethiopia.

1.3.2. Specific objective of the study

Specifically, this study addresses the following objectives;

- ✚ To determine the impact of assets on the profitability of private commercial banks.
- ✚ To examine the impact of liabilities on the profitability of private commercial banks.
- ✚ To explore the effect of bank sector concentration, inflation and level of GDP on the profitability of private commercial banks.

1.4. Hypothesis of the study

In line with the broad purpose statement the following hypotheses were also formulated for investigation. Hypotheses of the study stands on the theories related to a bank's profitability that has been developed over the years by banking area researcher's and past empirical studies related to a bank's profitability. The results from the literature review (to be established in the next chapter) were used to establish expectations for factors affecting bank profitability using statistical cost accounting model and other macro economic variables. Hence, based on the objective, the present study seeks to test the following five hypotheses:

HP1: There is a significant positive relationship between the assets of a bank and bank's profitability.

HP2: There is a significant negative relationship between the liabilities of a bank and bank's profitability.

HP3: There is a significant positive relationship between the concentration of the banking sector and bank's profitability.

HP4: There is a significant negative relationship between inflation and bank's profitability.

HP5: There is a significant positive relationship between real gross domestic product growth and bank's profitability.

1.5. Research Methodology

In order to achieve the broad research objectives a quantitative methods approach is adopted. To this end, to collect the necessary data the study adopted survey of documents. The survey is administered in a structured document review mode, and it is intended to elicit data relevant for factors having impact on the profitability of banks using statistical cost accounting model. For the study the target population consists of all private commercial banks registered by National Bank of Ethiopia (NBE) and under operation in the country at least for the last eleven years. Consequently, the study includes six leading private commercial banks in the country in terms of both branch network and market share namely, Awash International Bank (AIB), Bank of Abyssinia (BoA), Dashen Bank (DB), Nib International Bank (NIB), United Bank (UB) and Wogagen Bank (WB). The analyses are concentrated on the data available in financial statements of banks and other documents which had macroeconomic data in relation to the selected variables kept by NBE, the banks themselves and Ministry of Finance and Economic Development (MoFED), covering the period of 2001-2011.

1.6. Significance of the Study

The significance of this research includes the following:

- ✚ First, it is expected to contribute to the management of private commercial Banks in Ethiopia to take measures to protect their banks from different risks, and maintain a sound and healthy financial system through an efficient and effective balance sheet management.
- ✚ Second, it helps other researchers as a source of reference for those who want to make further study on the area afterwards.
- ✚ Finally, it gives all stake holders in the area the opportunity to gain deep knowledge about the relationship of balance sheet, external factors and profitability.

1.7. Scope of the Study

The scope of the study is restricted to factors affecting profitability of private commercial banks in Ethiopia registered by the NBE that have at least eleven years data i.e., 2001-2011.

As a result, it includes the six leading private commercial banks in the country in terms of both branch network and market share namely, AIB, DB, BoA, WB, UB and NIB.

1.8. Limitation of the study

During the study, the researcher faced some uncontrollable (external) variables that affected the smooth implementation of the research although the researcher tried his best to design the research as properly as possible. For instance; lack of resource and relevant and up to date published literatures mainly in the context of Ethiopia and absence of full information displayed on websites were the major constraints during the study. Finally, the State owned banks are not considered. Therefore, the study does not reflect the overall picture of profitability of the banking industry in Ethiopia.

1.9. Structure of the report

The research was organized as follows: Chapter one presents introduction of the study. Chapter two contains a review of the literature. The research design and methodology is presented in chapter three. Chapter four presents data presentation, analysis and interpretation of the results. Finally, chapter five presented conclusions and recommendations were discussed.

Chapter 2 Review of the Literature

2.1 . Overview of the banking system in Ethiopia

Traditional financial system in Ethiopia has long history and paramount contribution to economic betterment and social wellbeing of the society. Traditional institutions organized with a sense of cooperation and risk sharing has enabled Ethiopians to experience saving and financial management within its cultural context. Eqqub and Edir are some of the informal financial institutions that shaped the social bond and interaction (Gebeyaw Aychile 2008).

Modern banking in Ethiopia was introduced after the agreement that was reached in 1905 between Emperor Minilik II and Mr.Ma Gillivray, representative of the British owned National Bank of Egypt. Following the agreement, the first bank called Bank of Abyssinia was inaugurated in Feb.16, 1906 by the Emperor. Within the first fifteen years of its operation, Bank of Abyssinia opened branches in different areas of the country in Harar (Eastern Ethiopia), Dire Dawa, Dessie and Djibouti. By 1931 Bank of Abyssinia legally replaced by Bank of Ethiopia shortly after Emperor Haile Selassie came to power.

The new Bank, Bank of Ethiopia, was a purely Ethiopian institution, was the first indigenous bank in Africa, and established by an official decree on August 29, 1931 with capital of £750,000. In 1941, another foreign bank, Barclays Bank, came to Ethiopia with the British troops and organized banking services in Addis Ababa, until its withdrawal in 1943. Then on 15 April 1943, the State Bank of Ethiopia commenced full operation after 8 months of preparatory activities. In 1945 and 1949, the Bank was granted the sole right of issuing currency and deal in foreign currency. The Bank also functioned as the principal commercial bank in the country and engaged in all commercial banking activities.

The National Bank of Ethiopia with more power and duties started its operation in January 1964. Following the incorporation as a share company on December 16, 1963 as per proclamation No.207/1955 of October 1963, Commercial Bank of Ethiopia took over the commercial banking activities of the former State Bank of Ethiopia. It started operation on January 1, 1964 with a capital of Eth. Birr 20 million. In the new Commercial Bank of Ethiopia, in contrast with the former State Bank of Ethiopia, all employees were Ethiopians.

There were two other banks in operation namely Banco di Roma S. and Banko di Napoli S.C. that later reapplied for license according to the new proclamation each having a paid up capital of Eth. Birr 2 million. The first privately owned bank, Addis Ababa Bank Share Company, was established on Ethiopians initiative and started operation in 1964 with a capital of 2 million in association with National and Grindlay Bank, London which had 40 percent of the total share. In 1968, the original capital of the Bank rose to 5.0 million and until it ceased operation, it had 300 staff at 26 branches.

There were other financial institutions operating in the country like:

- ✚ Imperial Savings and Home Ownership public Association, which specialized in providing loans for the construction of residential houses and to individuals under the guarantee of their savings.
- ✚ Saving and Mortgage Corporation of Ethiopia whose aims and duties were to accept savings and trust deposits account and provide loans for the construction, repair and improvement of residential houses, commercial and industrial buildings and carry out all activities related to mortgage operations.
- ✚ Agricultural Bank that provides loan for the agricultural and other relevant projects established in 1945. But in 1951 the Investment Bank of Ethiopia replaced it. In 1965,

the name of the bank once again hanged to Ethiopian Investment Corporation Share Company and the capital rose to Eth. Birr 20 million, which was fully paid up.

Following the declaration of socialism in 1974, the government extended its control over the whole economy and nationalized all large corporations. Organizational setups were taken in order to create stronger institutions by merging those that perform similar functions. Accordingly, the three private owned banks, Addis Ababa Bank, Banco di Roma and Banco di Napoli Merged in 1976 to form the second largest Bank in Ethiopia called Addis Bank with a capital of Eth. birr 20 million and had a staff of 480 and 34 branches. Then Addis Bank and Commercial Bank of Ethiopia S.C were merged by proclamation No.184 of August 2, 1980 to form the sole commercial bank in the country until the establishment of private commercial banks in 1994.

The Savings and Mortgage Corporation S.C. and Imperial Saving and Home Ownership Public Association were also merged to form the Housing and Saving Bank with working capital of Birr 6.0 million and all rights, privileges, assets and liabilities were transferred by proclamation No.60, 1975 to the new bank. The financial sector that the socialist oriented government left behind constituted only three banks and each enjoying monopoly in its respective market, the following was the structure of the sector at the end of the era: the National Bank of Ethiopia (NBE), the Commercial Bank of Ethiopia, and Agricultural and Industrial Development Bank.

Following the demise of the Dergue regime in 1991 that ruled the country for 17 years under the rule of command economy, the Ethiopian People's Revolutionary Democratic Front declared a liberal economy system. In line with this, Monetary and Banking proclamation of 1994 established the national bank of Ethiopia as a judicial entity, separated from the government and outlined its main function. Monetary and Banking

proclamation No.83/1994 and the Licensing and Supervision of Banking Business No.84/1994 laid down the legal basis for investment in the banking sector. Currently private commercial banks in Ethiopia reached to twelve as shown in the table 2.1 below.

Table 2.1 List of private commercial banks in Ethiopia

No	Private Commercial Bank	Establishment Year
1	Awash International Bank	1994
2	Dashen Bank	1995
3	Abyssinia Bank	1996
4	Wegagen Bank	1997
5	United Bank	1998
6	Nib International Bank	1999
7	Cooperative Bank of Oromia	2004
8	Lion International Bank	2006
9	Oromia International Bank	2008
10	Zemen Bank	2008
11	Bunna International Bank	2009
12	Birhan International Bank	2009

Source: www.nbe.gov.et

The next section (section 2.2) presents theoretical review. Section 2.3 covers the asset and liability management concept. Section 2.4 covers banking risk. Section 2.5 review of empirical studies related to factors affecting bank profitability using statistical cost accounting model. Finally, conclusions on literature review are presented section 2.6.

2.2.Theoretical review

This section reviews the basic theoretical issues related to banks and bank profitability and its determinants. Hence, section 2.2.1 presents the role of banks in the economy. Then, section 2.2.2 presents the theories related to bank profitability.

2.2.1. The role of banks

This paragraph discusses the role of banks in the economy and examines the question why banks exist. At first sight, the answer to this question is very intuitive and simple; banks act as an intermediary between those who are in need for money and those who have excess of money. Looking more closely to this question there could be a more detailed explanation. Namely, in a perfect capital market of Modigliani-Miller (1958), financial institutions are superfluous (Santos 2001); namely, entities can borrow and save directly through the capital market. In reality, such perfect market does not exist; transaction costs and monitoring costs distort capital markets. Furthermore, capital markets suffer from the information asymmetry and the agency problem. The agency problem refers to the dissimilar incentives of borrowers and savers, in a broader context it refers to the dissimilar incentives of principles and agents (Jensen & Meckling 1976). In a case of financial distress, borrowers are limited liable; implying that they have incentives to alter their behavior by taking on more risk than savers are willing to accept. Monitoring the borrowers' behavior is time consuming, complex and expensive for individuals. In general, in inefficient markets, financial intermediation is beneficial since banks have lower monitoring and transaction costs than individuals, due to economies of scale and scope.

Another important aspect of banking is the function of maturity transformation. Banks receive short-term savings from depositors and transform those savings into long-term

loans to borrowers. By holding a part of the short-term savings in liquid assets and cash, banks could withstand daily withdrawals from depositors. Banks offer a unique service; lending long term while guaranteeing the liquidity of their liabilities to depositors, which can withdraw their money at any time without a decline in nominal value (Schooner & Talyor 2010 cited in van Ommeren 2011). Capital markets cannot achieve maturity transformation with the same benefits as banks can. Individual investors face liquidity, price and credit risk, which they cannot diversify to the extent banks can. As savers do not withdraw their deposits at the same time, banks hold only a minor part of the savings in liquid cash. Thus, banks diversify liquidity risks over a large pool of savers. Individual savers can also diversify their investments in terms of credit and price risks but it remains unlikely that they could withdraw the investments at any time without facing liquidity issues.

Nowadays, bank activities are more diverse than ever. In the past decades, competition has increased and new activities have emerged. The traditional form of banking, receiving deposits and extending credits, has become less important. Ever since the complexity of balance sheet has increased, as did balance sheet and risk management (van Greuning & Bratanovic 2009 cited in van Ommeren 2011). Besides the incorporations of liquidity, price and credit risks in banking activities, banks increasingly faces market risks (e.g. interest rate risk and currency risk). One may assume that banks' risk managers properly diversify these risks and closely monitor borrowers' behavior to avoid bank failure or financial distress. Nevertheless, monitoring bank behavior is required to safeguard the continuity and stability of the banking sector due to moral hazard issues.

2.2.2. Theories of bank profitability

Studies on the performance of banks started in the late 1970s/early 1980s with the application of two industrial organizations models: the Market Power and Efficiency Structure theories (Athanasoglou et al. 2006). The balanced portfolio theory has also added greater insight into the study of bank profitability (Nzongang & Atemnkeng 2006). Thus, each of the aforementioned theories and others related to bank profitability and its determinants are discussed in detail in this particular section as follows.

The market power theories

As noted in Tregenna (2009) applied in banking the market power hypothesis posits that the performance of bank is influenced by the market structure of the industry. There are two distinct approaches within the market power theory; the Structure-Conduct-Performance (SCP) and the Relative Market Power (RMP) hypotheses. According to the SCP approach, the level of concentration in the banking market gives rise to potential market power by banks, which may raise their profitability. Banks in more concentrated markets are most likely to make „abnormal profits by their ability to lower deposits rates and to charge higher loan rates as a results of collusive (explicit or tacit) or monopolistic reasons, than firms operating in less concentrated markets, irrespective of their efficiency (Tregenna 2009). Unlike the SCP, the RMP hypothesis posits that bank profitability is influenced by market share. It assumes that only large banks with differentiated products can influence prices and increase profits. They are able to exercise market power and earn non-competitive profits (Tregenna 2009).

The efficiency theory

The efficiency hypothesis, on the other hand posits that banks earn high profits because they are more efficient than others. There are also two distinct approaches within the

efficiency; the X-efficiency and Scale–efficiency hypothesis. According to the X-efficiency approach, more efficient firms are more profitable because of their lower costs. Such firms tend to gain larger market shares, which may manifest in higher levels on market concentration, but without any causal relationship from concentration to profitability (Athanasoglou et al. 2006). The scale approach emphasizes economies of scale rather than differences in management or production technology. Larger firms can obtain lower unit cost and higher profits through economies of scale. This enables large firms to acquire market shares, which may manifest in higher concentration and then profitability (Athanasoglou et al. 2006).

The balanced portfolio theory

The portfolio theory approach is the most relevant and plays an important role in bank performance studies (Nzongang & Atemnkeng 2006). According to the Portfolio balance model of asset diversification, the optimum holding of each asset in a wealth holder's portfolio is a function of policy decisions determined by a number of factors such as the vector of rates of return on all assets held in the portfolio, a vector of risks associated with the ownership of each financial assets and the size of the portfolio. It implies portfolio diversification and the desired portfolio composition of commercial banks are results of decisions taken by the bank management. Further, the ability to obtain maximum profits depends on the feasible set of assets and liabilities determined by the management and the unit costs incurred by the bank for producing each component of assets (Nzongang & Atemnkeng 2006).

Risk-return trade off theory, the signaling and bankruptcy cost hypotheses

The balance sheet structure could also influence banks' profitability; in this context, the equity-to-asset ratio is an important balance sheet ratio that received much attention. For

this ratio, theoretical explanations assume different signs of the relationship with profitability. According to the Modigliani & Miller theorem there exists no relationship between the capital structure (debt or equity financing) and the market value of a bank (Modigliani & Miller 1958). In this context, there is no relationship that exists between the equity-to-asset ratio and funding costs or profitability. Nevertheless, as this chapter already mentioned the agency problem, information asymmetry and transaction costs distort Modigliani & Miller's perfect market. Thus, when the perfect market does not hold there could be a possible explanations for a negative relationship. Financing theory suggest that increasing risks, by increasing leverage and thus lowering the equity-to-asset ratio (increasing leverage), leads to a higher expected return as entities will only take on more risks when expected returns will increase; otherwise, increasing risks have no benefits. This theoretical explanation is known as the risk-return trade off (van Ommeren 2011).

There are also theoretical explanations for the opposite relationship that a higher equity-to-asset ratio has a positive effect on profitability. These explanations are based on the signaling and bankruptcy cost hypotheses. The first hypothesis states that a higher equity ratio is a positive signal to the market of the value of a bank (Berger 1995b). Less profitable banks cannot achieve such a signal since this will further deteriorate their earnings. In this way a lower leverage, indicates that banks perform better than their competitors who cannot raise their equity without further deteriorating the profitability. The latter hypothesis suggests that in a case where bankruptcy cost are unexpected high a bank hold more equity to avoid period of distress (Berger 1995b).

2.3. The asset liability management concept

Baum, G.(1996) defined Asset Liability Management as the practice of managing a business so that decisions and actions taken with respect to assets and liabilities are coordinated in order to ensure effective utilization of a company's resources to increase its profitability. ALM can be defined as the ongoing process of formulating, implementing, monitoring and revising strategies related to assets and profitability to achieve an organization's financial objectives given the organization's risk tolerance and other constraints. According to Dynamic Business Analysts, it is the coordination, or large scale simulation of an entire company to manage its assets and liability to enable financial company to operate in a more soundly and profitable environment and this enables financial institutions to define strategic asset allocation and to identify financial opportunities and uncertainty in order to improve its financial resources. Asset Liability management is relevant to, and critical for, the sound management of the finances of any organization that invests to meet its future cash flow needs and capital requirements.

Fabozzi et al. (1998) identified three requirements for a successful implementation of ALM. A thorough understanding of the ALM concept is the first among these requirements. It refers to a comprehensive recognition of the banking risk. Besides serving as a venue for understanding the scope of risk, ALM allows for the quantifiable assessment and effective management of various risk categories. Even in the absence of a formal ALM program, the understanding of these concepts provides a picture of the risk/reward tradeoff in which the financial institutions are engaged. The second step or requirement for the implementation of ALM is the development of an information system. Risk management involves gathering and monitoring relevant data. The set of data alone is likely to provide valuable information about the degree of financial risk affecting the institution. The third

step involves a design and implementation of the ALM decision making process. The Asset Liability Committee (ALCO) usually carries out this process.

2.3.1. Objectives of asset liability management

According to Dynamic Business Analyst, (2011) a vital issue in strategic bank planning is asset and liability management, which is the assessment and management of endogenous-financial, operational, business and exogenous risks.

The objective of ALM is to maximize profit through efficient fund allocation given an acceptable risk structure. ALM is a multidimensional process, requiring simultaneous interactions among different dimensions. If the simultaneous nature of loan management is discarded, the decreasing risk in one dimension may result in unexpected increases in other risks.

New information-based activities and financial innovation increased types of endogenous and exogenous risks as well as the correlation between these. Consequently, the structure of balance sheet instruments has become more complex and the volatility in the banking system has increased. These developments necessitate the use of quantitative skills to manage risks more objectively and improve performance.

2.4. Banking Risk

Banking risk is an integral part of financial activities, and the management of risk is central to the bank's financial management. The recognition of various classes of risk is the first fundamental requirement for an effective asset/liability management (Fabozzi, Konishi, 1998). Therefore, this section demonstrates an overview of various risk categories encountered by banking institutions, along with approaches to bank risk management. It elaborates the banking risk structure and presents the main risk measurement and management techniques.

2.4.1. Banking Risk Classification

A useful definition of banking risk is provided by Saunders (1997). According to his view, **banking risk is a probability that the actual return on banking investment will differ from its expected return due to internal and/or external factors.** The literature divides banking risk into six distinctively different categories: Balance sheet risk, Regulatory risk, Technological risk, Operational risk, Strategic risk, and Affiliation risk (Sinkey, 1998). Only the balance sheet risk is scrutinized in this paper.

The balance sheet risk incorporates various types of portfolio risk recognition and assessment, which is particularly important to bank's asset and liability management. The balance sheet risk (portfolio risk) in banking can be further classified into:

- 1) **Interest rate risk:** - a risk resulting from changes in the level of interest rates incurred by financial institution when the maturity of its assets and liabilities are mismatched.
- 2) **Credit risk:** - a potential delinquency or default by borrower.
- 3) **Liquidity risk:** - inability to meet withdrawals and/or finance loans.
- 4) **Foreign exchange risk:** - a risk that unexpected exchange rate changes can negatively affect the value of assets and liabilities.
- 5) **Insolvency risk:** - a risk that a bank may not have enough capital to offset a sudden decline in the value of its assets relative to its liabilities.
- 6) **Costs of fund risk:** - an unanticipated change in the costs of funds.

All these diverse types of portfolio risk require application of different tools and techniques for its measurement and management. They are examined in the next section.

2.4.2. Balance Sheet Risk Measurement and Management

Hedging and minimizing the risk are the main functions of risk management. In general terms, risk management techniques can be grouped into three categories (Saunders, 1997):

1. On-balance sheet matching of assets and liabilities in terms of reprising. For those techniques such tools like GAP analysis and duration analysis are in use.
2. Off-balance sheet hedging of one or more risk categories. Among main tools here are derivatives, financial futures, etc.
3. Securitization of assets. This technique takes the risk out of balance sheet by exchanging the assets into securities and selling them to investors.

All those risk management and measurement techniques are described in the next sections with reference to particular types of risk.

Interest rate risk

Among the main tools used for interest rate risk measurement are GAP analysis, duration analysis, and the combination of the two. GAP measures the difference between rate-sensitive assets (RSA) and rate-sensitive liabilities (RSL) over a particular time horizon. It provides a proxy measure of the bank interest income.

Credit risk

Credit risk is the uncertainty associated with a borrower's loan repayment. If the expected probability of default is d , then the expected probability of receiving payment is $(1-d)$ (Sinkey, 1998). Banks must protect their interests by monitoring closely potential and existing borrowers. In order to diminish the probability of default, banks must screen out the good credit risks from the bad ones. According to katarzyna zawalińska (1999), specialization in lending, long term customer relationships and loan commitment are mentioned as techniques of credit risk management.

Liquidity risk

From the point view of Anthony M. Santomero (1997) liquidity risk, can be described as the risk of a funding crisis. While some would include the need to plan for growth and

unexpected expansion of credit, the risk here is seen more correctly as the potential for a funding crisis. Such a situation would inevitably be associated with an unexpected event, such as a large charge off, loss of confidence, or a crisis of national proportion such as a currency crisis. Saunders (1997) and Sinkey (1998) figured out that net liquidity position, peer group comparison, and application of liquidity index and measuring financing GAP and financing requirements as ways of measuring liquidity exposure of banks.

Foreign exchange risk

The currency risk is that of incurring losses due to changes in the exchange rates. Variations in earnings result from the indexation of revenues and charges to exchange rates or of changes of the values of assets and liabilities denominated in foreign currencies (Joel Bessis, 2002). There are, in principle, two ways in which banks can manage the foreign risk exposure: on-balance-sheet hedging and off-balance-sheet hedging.

2.5. Asset liability management and profitability

Banks' profitability is of utmost concern in modern economy. Banks are in a business to receive deposits or liabilities and to issue debt securities on one hand and create or invest in assets on the other hand (Fama 1980). Commercial Banks incur costs for their liabilities and earn income from their assets. Thus profitability of banks is directly affected by management of their assets and liabilities. In addition, different market and macroeconomic factors also influence the ability of the banks to make profits (Short 1979, Molyneux, and Thornton 1992, Athanasoglou et al. 2008).

Different studies are done explaining the influence of composition of assets and liabilities on banks' profitability. Hester & Zoellner(1966); Kwast & Rose,(1982); Vasiliou, (1996);Kosmidou et al. (2004); and Asiri, (2007) can be mentioned. Hester & Zoellner (1966) employed statistical cost accounting (SCA) method on US banks and found

statistically significant coefficients for most of the categories of assets and liabilities and rejected the null hypothesis that there is no relationship between them. Vasiliou (1996), by employing SCA method, suggests that asset management rather than liability management play more prominent role in explaining inter-bank differences in profitability. However, these findings contrast with the findings of Kosmidou et al. (2004) who find that liability management contributes more in creating the profitability differences among the banks. These authors did not incorporate the variables relating to macro economic and market structure in their model. With this view, Kwast & Rose (1982) expanded the traditional SCA model by including market structure and macroeconomic variables. Nonetheless, their model found no evidence that differential returns and costs on different categories of assets and liabilities exist between high and low profit banks. In a recent study, Asiri (2007) has applied SCA method and finds that assets are positively and liabilities are negatively related to the profitability of the Kuwaiti banks.

Muhammad & Mohammad (2009), in their application of SCA to assess ALM impact on profitability they recognized that Private BCBs are better than public banks in terms of asset management, but they do not have any superiority over public banks in terms of liability management. This does not provided them a conclusive support that ALM in private banks is superior to ALM in public banks. Thus, study could not explain the profitability differences between these two sets of banks through analyzing ALM. Their study considered the market concentration index and GDP growth rate, unlike the previous ones.

2.5.1. Industry-specific variable

This subsection discusses the industry concentration variable separately from bank-specific variables as far as this variable is to some extent external. That means managers cannot change the variable immediately like that of bank-specific variables.

Industry Concentration Level: Two theories are proposed to explain how the degree of sector concentration affects bank profitability. The SCP hypothesis states that a more concentrated sector favors bank profitability motivated by the benefits of greater market power. On the other hand, the efficiency theory explains the positive relationship between concentration and profitability as an indirect consequence of efficiency. This theory argues that the better managed banks or those with more efficient (and thus more profitable) cost structures could see their market shares increase, resulting in a higher degree of concentration. Berger and Humphrey (1997) find that the cost efficiency hypothesis seems to be more important than the market-power theory in explaining bank profitability when frontier efficiency analysis is applied. However, the empirical evidence on the relationship between concentration and profitability is not conclusive. For example, Goddard et al. (2004) and Ponce (2012) report a positive relationship between market concentration and profitability; other studies do not find such a relationship (Berger, 1995a). In this study the researcher uses the most popular measure of industry concentration level namely, Herfindahl–Hirschman index (HHI) to measure industry concentration similar to Sastrosuwito & Suzuki (2011) and Ponce (2012) among others.

2.5.2. Macroeconomic variables

Among others, Aburime (2008) use several macroeconomic control variables that probably affect banks profitability. The macroeconomic control variables are external for banks managers and uncontrollable. The growth of real gross domestic product and the inflation

rate are selected as possible macroeconomic variables that can affect bank profitability in this study.

Real GDP growth: Poor economic conditions can worsen the quality of the loan portfolio, generating credit losses and increasing the provisions that banks need to hold, thereby reducing bank profitability. In contrast, an improvement in economic conditions, in addition to improving the solvency of borrowers, increases demand for credit by households and firms with positive effects on the profitability of banks (Athanasoglou et al, 2008).

Inflation: Another important macro-economic condition which may affect both the costs and revenues of banks is the inflation rate (INFL). In this regard, Revell (1979 cited in Ponce 2012) introduces the issue of the relationship between bank profitability and inflation, stating that the effect of inflation on bank profitability depends on how inflation affects both salaries and the other operating costs of the bank. In this context, Staikouras & Wood (2003) point out that as inflation may have direct effects, that is, increase in the price of labor, and indirect effects, that is, changes in interest rates and asset prices, on the profitability of banks. Perry (1992) also suggests that as the effects of inflation on bank performance depend on whether the inflation is anticipated or unanticipated. In the anticipated case, the interest rates are adjusted accordingly, resulting in revenues to increase faster than costs and subsequently, having positive impact on bank profitability. On the other hand, Oguzsoy and Guven (1997) found that banks' profitability is adversely affected by inflationary situation which make banks vulnerable to default risk, interest rate risk and liability risk. Due to onslaught of so many risks, bank may face a huge amount of loss in a variable inflationary environment.

2.6. Conclusion and knowledge gap

Commercial Banks play an important role in economic development and they are the base of financial systems in all countries. Hence to achieve this healthy and sustainable profitability is essential issue. As the review of literature discussed in this chapter reveals efficient composition of assets and liabilities of commercial banks is crucial for their sound financial performance.

A lot of research work had so far taken place concerning the issue of factors affecting bank's profitability. However, in Ethiopia, most studies conducted in the banking system were focused on the overall determinants of banking profitability.

The review of literature discussed in this chapter reveals the existence of many gaps of knowledge in measuring factors affecting bank profitability using statistical cost accounting model on profitability of private Commercial Banks in Ethiopia. As far as the knowledge of the researcher no studies were carried out on the issue of factors affecting bank profitability of private commercial banks in Ethiopia using statistical cost accounting model.

This study, therefore, is an attempt to address this gap of information on Ethiopian commercial banking sector. Thus the intent of this study was to examine factors affecting bank profitability using statistical cost accounting model together with external variables such as degree of market concentration, GDP and inflation rate affect the profitability of private commercial banks in Ethiopia. Finally, the next chapter presents details of research design and methodology used so as to the objective of this study.

Chapter 3 Research design and methods

The preceding chapter presented the review of the existing evidence on factors affecting profitability of commercial banks and identified the knowledge gap. The results from a review of the literature are used to establish expectations for the relationship of the different determinants. Therefore, the purpose of this chapter is to present the research hypotheses, the underlying principles of research methodology and the choice of the appropriate research method for the thesis. The chapter is organized as follows. The first section 3.1 presented the research hypotheses along with the broad research objective. Section 3.2 discussed the research approaches while section 3.3 presented the method adopted in the study and finally 3.4 presented model specification and data properties.

3.1. Hypotheses and determinants selection

As already shown in the first chapter, in the context of the problems highlighted the broad objective of this research is to assess factors affecting profitability of private commercial bank in Ethiopia. In line with the broad purpose statement five hypotheses were formulated for investigation purpose. Hence, subsection 3.1.1 presents the dependent variable as proxy for banks' profitability. Then the independent variables that are selected and categorized into bank-specific, industry-specific and macroeconomic determinants of banks' profitability are presented in subsection.

3.1.1 Dependent variable

In the literature, there are two major alternative measures of profitability, namely ROA and ROE. ROA reflects the ability of bank's management to generate profits from the bank's assets, although it may be biased due to off-balance-sheet activities. ROE shows the return to the shareholders on their equity. As highlighted by Athanasoglou et al. (2008) and Sufian (2011), many scholars suggest that ROA is the key ratio for the evaluation of bank

profitability given that ROA is not distorted by high equity multipliers, while ROE disregards the risks associated with high leverage and financial leverage. Therefore, this study attempts to measure profitability by using ROA similar to most of the aforementioned researchers. ROA is measured as net profit before tax divided by average of total assets similar to Olweny & Shipho (2011).

3.1.2. Independent variables and hypothesis

A number of authors (Hester & Zoellner, 1966; Kwast & Rose, 1982; Vasiliou, 1996; Kosmidou et al, 2004; and Asiri, 2007) have studies about the influence of the composition of assets and liabilities on the profitability of bank. For the first time, Hester & Zoellner (1966) employed statistical cost accounting (SCA) method on US banks. Their study examines whether significant relationship exists between assets/liabilities standardized with total assets with return on assets of individual banks. They found statistically significant coefficients for most of the categories of assets and liabilities and rejected the null hypothesis that there is no relationship between them.

Vasiliou (1996) investigated portfolio of assets and liabilities between high-profit and low-profit Greek banks by employing SCA method. His regression results suggest that it is the asset management rather than liability management that play more prominent role in explaining interbank differences in profitability. This study implies that high profit banks earn higher return on their assets than that of low profit banks. At the same time high profit banks enjoy lower expenses for their liabilities. These findings contrast with the findings of Kosmidou et al (2004) who find that liability management contributes more in creating the profitability differences among the banks.

Kwast & Rose (1982) provided most comprehensive study on the impact of bank's asset portfolio composition on its earnings. This study expanded the traditional SCA model by

including a firm's income to its asset and liability mix. The authors focused on the large US banks and used data from 1970 to 1977 for their estimation. Their model found no evidence that differential returns and costs on different categories of assets and liabilities exist between high and low profit banks.

Asiri (2007) has also applied SCA method on 8 Kuwaiti banks. The study finds that assets are positively and liabilities are negatively related to the profitability of the Kuwaiti banks. Thus, the variables are expected to exhibit positive and negative relationship with bank profitability for assets and liabilities.

HP1: There is a significant positive relationship between assets of a bank and bank's profitability

HP2: There is a significant negative relationship between liabilities of a bank and bank's profitability

Industry Concentration Level: Two theories are proposed to explain how the degree of sector concentration affects bank profitability. The SCP hypothesis states that a more concentrated sector favors bank profitability motivated by the benefits of greater market power. On the other hand, the efficiency theory explains the positive relationship between concentration and profitability as an indirect consequence of efficiency. This theory argues that the better managed banks or those with more efficient (and thus more profitable) cost structures could see their market shares increase, resulting in a higher degree of concentration. Berger and Humphrey (1997) find that the cost efficiency hypothesis seems to be more important than the market-power theory in explaining bank profitability when frontier efficiency analysis is applied. However, the empirical evidence on the relationship between concentration and profitability is not conclusive. For example, Goddard et al. (2004) and Ponce (2012) report a positive relationship between market concentration and

profitability; other studies do not find such a relationship (see e.g., Berger, 1995a). In this study the researcher uses the most popular measure of industry concentration level namely, Herfindahl–Hirschman index (HHI) to measure industry concentration similar to Sastrosuwito & Suzuki (2011) and Ponce (2012) among others. In this study in support of the two theories, the researcher hypothesizes a direct association between industry concentration and bank profitability in Ethiopia.

HP3: There is a significant positive relationship between the concentration of the banking sector and the bank's profitability.

Real GDP growth: Poor economic conditions can worsen the quality of the loan portfolio, generating credit losses and increasing the provisions that banks need to hold, thereby reducing bank profitability. In contrast, an improvement in economic conditions, in addition to improving the solvency of borrowers, increases demand for credit by households and firms with positive effects on the profitability of banks (Athanasoglou et al. 2008). Thus, the variable is expected to exhibit positive relationship with bank profitability.

HP4: There is a significant positive relationship between real gross domestic product growth and bank's profitability

Inflation: Another important macro-economic condition which may affect both the costs and revenues of banks is the inflation rate (INFL). In this regard, Revell (1979 cited in Ponce 2012) introduces the issue of the relationship between bank profitability and inflation, stating that the effect of inflation on bank profitability depends on how inflation affects both salaries and the other operating costs of the bank. In this context, Staikouras & Wood (2003) point out that as inflation may have direct effects, that is, increase in the price of labor, and indirect effects, that is, changes in interest rates and asset prices, on the profitability of banks. Perry (1992) also suggests that as the effects of inflation on bank

performance depend on whether the inflation is anticipated or unanticipated. In the anticipated case, the interest rates are adjusted accordingly, resulting in revenues to increase faster than costs and subsequently, having positive impact on bank profitability. On the other hand, Oguzsoy and Guven (1997) found that banks' profitability is adversely affected by inflationary situation which make banks vulnerable to default risk, interest rate risk and liability risk. Due to onslaught of so many risks, bank may face a huge amount of loss in a variable inflationary environment. Thus, the variable is expected to exhibit negative relationship with bank profitability.

HP5: There is a significant negative relationship between inflation and bank's profitability

The following table 3.1 presents the summary of hypothesized expected sign for the relationship between three assets, four liabilities of the balance sheet and macroeconomic explanatory variables (independent variables) and profitability of private commercial banks' (dependent variable).

Table 3.1 Description of the variables and their expected relationship

Variables	Measure	Notation	Expected sign
Dependent Variable			
Profitability	Net profit before tax/Average of assets	ROA	NA
Independent Variables			
Loan and advance	Loan and advance/Average of assets	A1	Positive
Deposit with other banks	Deposit with other banks/Average of assets	A2	Positive
Other investments	Sum of investments/Average of assets	A3	Positive
Saving deposit	Saving deposit/Average of assets	L1	Negative
Demand deposit	Demand deposit/Average of assets	L2	Negative
Fixed deposit	Fixed deposit/Average of assets	L3	Negative
Other liabilities	Other liabilities/Average of assets	L4	Negative
Industry specific factors			
Industry concentration Level	Herfindahl-Hirschman index	HHI	Positive
Macro economic factors			
Inflation	The annual inflation rate	INF	Negative
Economic growth	Real GDP growth (in %)	GDP	Positive

3.2. Research approaches

As noted in Creswell (2003, p.13) in terms of investigative study there are three common approaches to business and social research namely, quantitative, qualitative and mixed methods approach. Quantitative research is a means for testing objective theories by examining the relationship among variables (Creswell 2009). On the other hand, qualitative research approach is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem with intent of developing a theory or pattern inductively (Creswell 2009). Finally, mixed methods approach is an approach in which the researchers emphasize the research problem and use all approaches available to understand the problem (Creswell, 2003).

Hence, based on the above discussions of the three research approaches and by considering the research problem and objective, in this study, the quantitative method was adopted.

3.3. Research methods

Considering the aims and objectives, quantitative method is applied in this research. It uses panel data by utilizing Ordinary Least Square (OLS) method. OLS is a statistical technique that uses sample data to estimate the true population relationship between two variables, namely dependent and independent variables. OLS is a method to estimate and find the best fitting line which minimizes the sum of squared residuals (SSR),(Koop, 2000:40).

The reason why this study adopts this method is that under certain condition the OLS estimator can be shown to be more efficient than many competing estimators. One estimator is said to be more efficient than another if on average the former yields more accurate estimates than the latter. According to Pesaran and Pesaran (1997), the reason for this terminology is that an estimator which yields more accurate estimates can be thought of as utilizing and defining the information available in the sample more efficiently.

3.3.1. Sampling design

The population of this study included all private commercial banks in Ethiopia. However, commercial banks which started their operation after 2001 were not considered. As results, out of the 12 private commercial banks, six commercial banks Abyssinia Bank, Awash Bank, Dashen Bank, Nib International Bank, United Bank and Wegagen Bank are selected. All private commercial banks included in this study are operated for decades. Thus, the study used an eleven years data for all sampled banks.

3.3.2. Data collection

In order to analyze factors affecting profitability of bank audited financial statements of six banks (AIB, BoA, DB, NIB, WB, and UB) for 11 consecutive years .i.e., from 2001-2011 were collected. The secondary data that were collected through structured document reviews are mainly from the records held by NBE and the banks themselves. Moreover, in order to analyze the relationship that exists between profitability and macro-economic variables, macroeconomic data were also collected for the same years. Those macroeconomic data were mainly gathered from the records held by NBE and MoFED through structured document review.

3.3.3. Data analysis techniques

To comply with the objective, the paper was based on panel data, which was collected through structured document review. As noted in Baltagi (2005) the advantage of using panel data is that it controls for individual heterogeneity, less collinearity among variables and tracks trends in the data, something which simple time-series and cross-sectional data cannot provide. Thus, the collected panel data was analyzed using descriptive statistics, correlations, multiple linear regression analysis and inferential statistics. Mean values and standard deviations were used to analyze the general trends of the data from 2001 to 2011

based on the sector sample of 6 banks and a correlation matrix was also used to examine the relationship between the dependent variable and explanatory variables. A multiple linear regression model and t-static was used to determine the relative importance of each independent variable in influencing profitability. The multiple linear regressions model was run, and thus OLS was conducted using EVIEWS 6 econometric software package, to test the casual relationship between the firms' profitability and their potential determinants and to determine the most significant and influential explanatory variables affecting the profitability of Ethiopian private commercial banks. The rational for choosing OLS is as noted in Petra (2007) OLS outperforms the other estimators when the following holds; the cross section is small and the time dimension is short. Therefore, as far as both the above facts hold true in this study it is rational to use OLS. In light of the above, to investigate the factors affecting bank's profitability using statistical cost accounting model the following regression equation similar to Kwast & Rose (1982) and Kosmidou et al, 2004 was adopted.

3.4. Model specification and data properties

3.4.1. The traditional model

Statistical Cost Accounting (SCA) model is described by Hester & Zoellner (1966) as a regression method by which rates of return are imputed to earning assets and deposit liabilities. Kwast & Rose (1982) also adopted the SCA model with some modification to examine the impact of ALM on the profitability of commercial banks in Bangladesh.

A bank earns revenue from many sources and prominent of these are interest income, service fees and commissions from its assets and income from using liabilities. On the other hand, costs of banks are also sourced from bank's assets and liabilities. These expenses include interest expenses on deposits, other liabilities and administrative expenses. Now, if

we subtract operating costs from operating revenues we will get net operating income for the banks. Thus variations in banks' net operating income, Y_{bt} can be expressed for bank b and time t in terms of variations of assets and liabilities in the following way:

$$Y_{bt} = \alpha_1 + \sum \alpha_{2i} A_{ibt} + \sum \alpha_{3j} L_{jbt} + e_{bt} \text{----- (1)}$$

Where,

Y_{bt} = Net income before tax

A_i = i th asset

L_j = j th liability

α_1 = net fixed income that is not dependent on assets and liabilities.

e_{bt} = stochastic term

α_{2i} = marginal rates of return on assets

α_{3j} = marginal costs of liabilities

As banks have wide variations in their business volume, all the variables of equation (1) are divided by a bank's average of total asset (T_{Abt}) (Kosmidou et al, 2004). Thus equation one takes the form of:

$$Y_{bt} / T_{Abt} = \alpha_1 / T_{Abt} + \sum \alpha_{2i} A_{ibt} / T_{Abt} + \sum \alpha_{3j} L_{jbt} / T_{Abt} + u_{bt} \text{----- (2)}$$

T_{Abt} = Average of total assets

Y_{bt} / T_{Abt} = Return on asset for bank i at time t

Where, the stochastic term $u_{bt} = e_{bt} / T_{Abt}$

3.4.2. The modified model

The structure of the traditional SCA model implies that all banks experience identical interest rates on bank's assets and liabilities. In reality, a number of factors may affect bank's earning and costs relating to assets and liabilities. These factors are market structure and macroeconomic conditions. If these factors are not included in the model, regression

results will be unreliable and coefficients will be biased. Kwast & Rose (1982) incorporated the influences of these factors and presented a modified model as equation 3. This study also adopted the model adopted by kwast and Rose (1982), for selected private commercial banks in Ethiopia.

$$\text{ROA}_{it} = \alpha_1/\text{TA}_{bt} + \sum \alpha_2 i \text{A}_{ibt}/\text{TA}_{bt} + \sum \alpha_3 j \text{L}_{jbt} / \text{TA}_{bt} + \sum \alpha_4 \text{HHI}_{it} + \sum \alpha_5 \text{INF}_{it} + \sum \alpha_6 \text{GDP}_{it} + \text{ubt} \text{ ----- (3)}$$

Where

ROA_{it} = Return on asset for bank i at time t

HHI = Herfindahl Index of market concentration associated with each bank

INF= Inflation as a binary variable for number of years.

GDP = Gross Domestic product

The Herfindahl Index is the sum of the squared market shares of the firms in the market. Pasiouras and Kosimidou (2007) found a direct relationship between market concentration and firm profitability. Thus, the inclusion of HHI in the model helps to assess the influence of local market concentration on bank earnings.

Oguzsoy and Guven (1997) found that banks' profitability is adversely affected by inflationary situation which make banks vulnerable to default risk, interest rate risk and liability risk. Due to onslaught of so many risks, bank may face a huge amount of loss in a variable inflationary environment. Since inflation is one of the most important macroeconomic variables that impact bank's profitability, it is included in the model as a binary variable (INF) in equation (3).

This study measures the net operating income as dependent variable. Net operating income (*Y_{bt}*) is the portion of total income that is left out after deducting operating costs from the total income. Thus, when this variable provides the income measure in the regression, the

α_{2i} estimates net rates of return on assets. Similarly, the liability coefficients may be interpreted as the marginal cost of a particular liability. The sign of each α_{3j} should, therefore, be negative or zero because operating costs are generally higher than the service charges earned from the deposits. The α_I coefficient reflects net operating income (costs) which are related to off-balance sheet items. Thus the sign of α_I may be positive or negative. Moreover, since α_I reflects a net income variable, it may be interpreted as a measure of economies of scale (Kwast & Rose, 1982).

This study does not use net income after tax as a dependent variable as tax rate is fixed by the government from time to time and not influenced by assets and liabilities. All assets and liabilities are not included as independent variables in this model to avoid perfect collinearity within the independent variables (Muhammad and Mohammad, 2009).

. Hence, 'cash' and 'fixed assets' on the assets side and 'equity capital' on the liabilities side is excluded from the model.

For asset and liability values, average figures are used in the model. For each year, the beginning and ending book values are used to compute the average book values. These values are divided by average total asset of the year to express them as ratios for the same period.

3.4.3. Data properties

A fixed cross-sectional effect is specified in the estimation so as to capture unobserved idiosyncratic effects of different banks. In addition, as noted in Gujarati (2004) if T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model and random effect model. Hence, the choice here is based on computational convenience. On this score, fixed effect model may be preferable than random effect model

(Gujarati 2004). Since the number of time series (i.e. 11 year) is greater than the number of cross-sectional units (i.e. 6 private commercial banks) and adjusted R^2 value and Durbin-Watson stat value increases with the use of cross-sectional fixed effect model, fixed effect model is preferable than random effect model in this case.

As noted in Brooks (2008) there are basic assumptions required to show that the estimation technique, OLS, had a number of desirable properties, and also so that hypothesis tests regarding the coefficient estimates could validly be conducted. If these Classical Linear Regression Model (CLRM) assumptions hold, then the estimators determined by OLS will have a number of desirable properties, and are known as Best Linear Unbiased Estimators. Therefore, for the purpose of this study, diagnostic tests are performed to ensure whether the assumptions of the CLRM are violated or not in the model. Thus, the following section discusses about the nature and significance of the model misspecification tests.

Test for Heteroscedasticity

To test for the presence of heteroscedasticity, the popular white test would be employed in this study. This test involves testing the null hypothesis that the variance of the errors is constant (homoscedasticity) or no heteroscedasticity versus the alternative that the errors do not have a constant variance.

Test for Autocorrelation

This is an assumption that the errors are linearly independent of one another (uncorrelated with one another). If the errors are correlated with one another, it would be stated that they are auto correlated. To test for the existence of autocorrelation or not, the popular Durbin-Watson test was employed. As noted in Brooks (2008) the rejection / non-rejection rule would be given by selecting the appropriate region from the following figure:

Figure 3.1 Rejection and non-rejection regions for Durbin-Watson Test

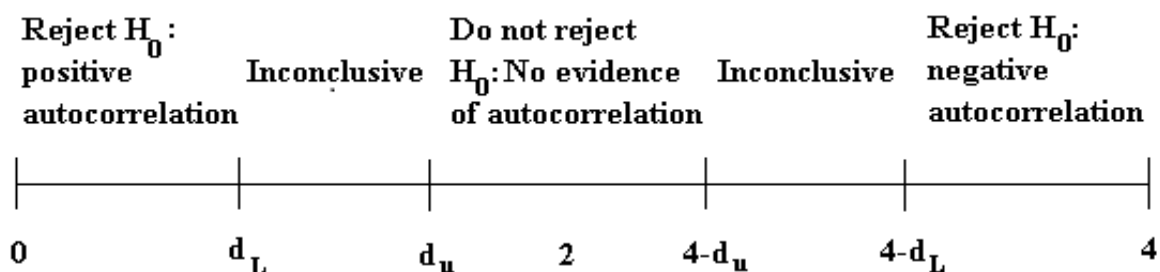


Figure 3.1 shows as Durbin-Watson has 2 critical values: an upper critical value (d_u) and a lower critical value (d_L).

Test for normality

As noted in Brooks (2008) a normal distribution is not skewed and is defined to have a coefficient of kurtosis of 3. One of the most commonly applied tests for normality; the Bera-Jarque formalizes these ideas by testing whether the coefficient of skewness and the coefficient of excess kurtosis are zero and three respectively. Brooks (2008) also states that, if the residuals are normally distributed, the histogram should be bell-shaped and the Bera-Jarque statistic would not be significant at 5% significant level.

Test for Multicollinearity

To test the independence of the explanatory variables or to detect any multicollinearity problem in regression model the study used a correlation matrix of independent variables. The problem of multicollinearity usually arises when certain explanatory variables are highly correlated. Usually, as noted by Hair et al. (2006) correlation coefficient below 0.9 may not cause serious multicollinearity problem. In contrary to this, Kennedy (2008) argued that as any correlation coefficient above 0.7 could cause a serious multicollinearity problem leading to inefficient estimation and less reliable results.

Coming back to the model, based on the general model provided earlier and on the base of selected variables the empirical model used in the study was as follows:

$$ROA_{it} = \alpha_1 / TA_{bt} + \sum \alpha_2 i A_{ibt} / TA_{bt} + \sum \alpha_3 j L_{jbt} / TA_{bt} + \sum \alpha_4 HHI_t + \sum \alpha_5 INF_t + \sum \alpha_6 GDP_t + u_{bt}$$

----- (3)

Where:

ROA_{it} = Return on asset for bank i at time t

A_i = ith asset

L_j = jth liability

α_1 = net fixed income that is not dependent on assets and liabilities.

u_{bt} = stochastic term

$\alpha_2 i$ = marginal rates of return on assets

$\alpha_3 j$ = marginal costs of liabilities

HHI = Herfindahl Index of market concentration associated with each bank

INF= Inflation as a binary variable for number of years.

GDP = Gross Domestic product

Finally, links between research hypotheses and variables on the one hand and different data sources on the other hand are presented in table 3.2 below.

Table 3.2 Link between research hypotheses, variables and the different data sources

Research Hypotheses	Variables	Data sources
Dependent variable Profitability	Factors affecting profitability of private commercial bank	
	Independent variables	Bank-specific data
<i>HP1: There is a significant positive relationship between the assets of a bank and bank's Profitability.</i>	-Loan and advance -Deposit with other banks - Sum of investments	from Income statement and Balance sheet held by NBE and the banks and macroeconomic data from the records held by NBE and MOFED
<i>HP2: There is a significant negative relationship between the liabilities of a bank and bank's profitability.</i>	-Saving Deposit -Demand deposit -Fixed Deposit -Other Liabilities	
<i>HP3: There is a significant positive relationship between the concentration of the banking sector and bank's profitability.</i>	-Concentration	
<i>HP4: There is a significant negative relationship between inflation and bank's Profitability.</i>	-Inflation	
<i>HP5: There is a significant positive relationship between real gross domestic product growth and bank's profitability.</i>	-GDP	

Chapter 4 Results and Analysis

The previous chapter presents the research methodology adopted in the study. The purpose of this chapter is to present and discuss results of data obtained from method involved in this study. Therefore, the chapter is organized into three sections. The first section 4.1 presents research hypotheses presented in the previous chapter. This is followed by the result of documentary analyses (structured review of documents) 4.2. Finally, Section 4.3 discusses the results of the study.

4.1. Research hypotheses

As stated in chapter one the broad objective of this study was to assess factors affecting profitability of private commercial banks in Ethiopia. Further, as noted in the previous chapters (chapter one and three), in order to achieve the broad objective the study developed the following five hypotheses.

HP1: There is a significant positive relationship between the assets of a bank and bank's profitability.

HP2: There is a significant negative relationship between the liabilities of a bank and bank's profitability.

HP3: There is a significant positive relationship between the concentration of the banking sector and bank's profitability.

HP4: There is a significant negative relationship between inflation and bank's profitability.

HP5: There is a significant positive relationship between real gross domestic product growth and bank's profitability.

In order to be able to investigate whether each of the research hypotheses presented above hold in the context of Ethiopian private commercial banks, the next section tries to present the result and analysis.

4.2. Results

The purpose of this section is to present the results of data obtained from method involved in the study. Therefore, the results of the documentary analysis (structured reviews of financial records) presented in the following subsections.

4.2.1. Documentary analysis

The major purpose of this study is to assess factors affecting profitability of private commercial banks in Ethiopia. The main data sources to this end are the documents held by NBE, MoFED and the banks themselves. The following discussion presents the results of the documentary analysis as follows. Section 4.2.1.1 presents tests for the classical linear regression model assumptions followed by the descriptive statistics in section 4.2.1.2. Section 4.2.1.3 presents the correlation analysis among the dependent and independent variables. Finally, the outcomes of the panel data regression analysis are presented in section 4.2.1.4.

4.2.1.1. Tests for the classical linear regression model (CLRM) assumptions

In this study as mentioned in chapter three diagnostic tests were carried out to ensure that the data fits the basic assumptions of classical linear regression model. Consequently, the results for model misspecification tests are presented as follows:

Test for Heteroscedasticity

In this study as shown in table 4.1, both the F-statistic and Chi-Square versions of the test statistic gave the same conclusion that there is no evidence for the presence of heteroscedasticity, since the p-values were in excess of 0.05. The third version of the test

statistic, “Scaled explained SS”, which as the name suggests is based on a normalized version of the explained sum of squares from the auxiliary regression, also gave the same conclusion that there is no evidence for the presence of heteroscedasticity problem, since the p-value was considerably in excess of 0.05.

Table 4.1 Heteroscedasticity Test: White

F-statistic	29.57141	Prob. F(64,1)	0.1453
Obs*R-squared	65.96515	Prob. Chi-Square(64)	0.4087
Scaled explained SS	49.07627	Prob. Chi-Square(64)	0.9159

Source: Financial statements of banks, MoFED reports and own computation

Test for Autocorrelation

The Durbin-Watson test statistic value in table 4.2 was 1.231. As mentioned in the previous chapter to empirically analyze factors affecting profitability of private commercial banks using statistical cost accounting model 66 (6*11) observations were used in the model. Moreover, there were 10 regressors and an intercept term in the model. Therefore, the relevant critical values for the test are $dL = 1.120$, $dU = 1.802$, i.e., for 66 observations and 10 regressors and $4 - dU = 4 - 1.802 = 2.198$; $4 - dL = 4 - 1.120 = 2.88$. Accordingly, Durbin-Watson test **1.231** is clearly between the lower limit (dL) which is 1.120 and the upper limit which is 1.802 and thus the null hypothesis is neither rejected nor not rejected.

Table 4.2 Autocorrelation Test: Durbin Watson

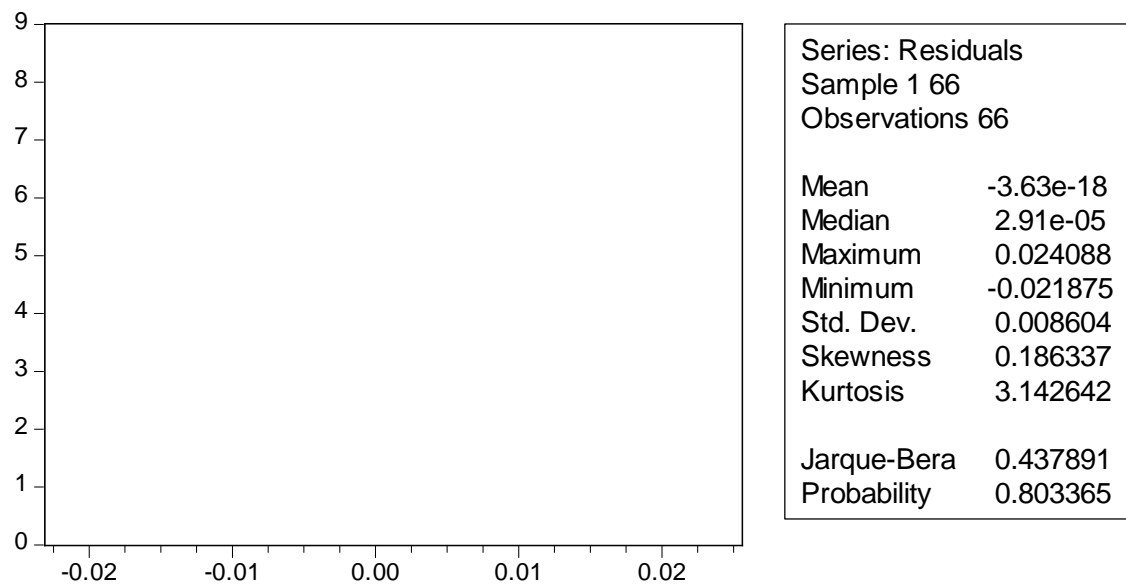
Variables	DW test static result
All bank-specific, industry-specific & macro-economic	1.231

Source: Financial statements of banks, MoFED reports & own computation

Test for normality

The normality tests for this study as shown in figure 4.1, the coefficient of kurtosis was close to 3, and the Bera-Jarque statistic had a P-value of 0.803 implying that the data were consistent with a normal distribution assumption.

Figure 4.1 Normality test for residuals



Source: Financial statements of banks, MoFED reports and own computation

Test for Multicollinearity

Correlation matrix between independent variables is presented in table 4.3. As shown in table 4.3 there were fairly low data correlations among the independent variables. These low correlation coefficients indicate that, there is no problem of multicollinearity in this study. Moreover, Kennedy (2008) stated that multicollinearity problem exists when the correlation coefficient among the variables are greater than 0.70, but in this study there is no correlation coefficient that exceeds 0.70. Accordingly, in this study there is no problem of multicollinearity which enhanced the reliability for regression analysis.

Table 4.3 Correlation matrixes of independent variables

	A1	A2	A3	L1	L2	L3	L4	HHI	INF	GDP
A1	1.000									
A2	0.071	1.000								
A3	0.013	-0.407	1.000							
L1	0.300	-0.297	0.430	1.000						
L2	-0.189	0.288	-0.310	-0.527	1.000					
L3	0.436	0.511	-0.446	-0.452	0.120	1.000				
L4	0.169	0.010	0.209	-0.170	-0.065	0.059	1.000			
HHI	0.536	0.172	0.188	0.122	-0.238	0.237	0.081	1.000		
INF	-0.337	-0.273	-0.268	-0.138	0.198	-0.099	0.024	-0.697	1.000	
GDP	-0.153	-0.119	-0.208	-0.017	0.177	-0.096	-0.220	-0.595	0.368	1.000

Source: Financial statements of banks, MoFED reports and own computation

4.2.1.2. Descriptive statistics

Table 4.4 presents the outcomes of the descriptive statistics for main variables involved in the regression model. Key figures, including mean, median, standard deviation, minimum and maximum value were reported. This was generated to give overall description about data used in the model and served as data screening tool to spot unreasonable figure.

Table 4.4 Descriptive Statistics

Variables	Observations	Mean	Median	Max	Min	Std. Dev.
ROA	66	0.039	0.044	0.072	0.005	0.014
A1	66	0.628	0.645	1.245	0.069	0.154
A2	66	0.175	0.163	0.365	0.071	0.072
A3	66	0.081	0.063	0.277	0.007	0.066
L1	66	0.526	0.532	0.871	0.062	0.134
L2	66	0.099	0.228	0.451	0.131	0.063
L3	66	0.240	0.082	0.317	0.0008	0.070
L4	66	0.135	0.121	0.427	0.029	0.067
HHI	66	0.493	0.466	0.694	0.357	0.111
INF	66	0.111	0.106	0.364	-0.106	0.122
GDP	66	0.088	0.112	0.126	-0.021	0.045

Source: Financial statements of banks, MoFED reports and own computation

According to table 4.4, all variables comprised 66 observations and the profitability measure used in this study namely; ROA indicates that the Ethiopian private commercial banks attained, on average, a positive before tax profit over the last eleven years. For the total sample, the mean of ROA was 3.9% with a minimum of 0.5% and a maximum of 7.2%. That means, the most profitable bank among the sampled banks earned 7.2 cents of profit before tax for a single birr invested in the assets of the firm. On the other hand, the least profitable bank of the sampled banks earned 0.5 cents of profit before tax for each birr invested in the assets of the firm. The standard deviation statistics for ROA was 0.014 which indicates that the profitability variation between the selected banks was very small. The result implies that these banks need to optimize the use of their assets to increase the return on their assets.

Regarding the explanatory variables of the model there are some interesting statistics that have to be mentioned. The mean value of the loan and advance (A1) is 62.8% with standard deviation of 15.4%. Deposit with other banks (A2) variable has the mean value of 17.5%

with standard deviation of 7.2%. Sum of investments (A3) has a mean of 8.1% with standard deviation of 6.6 which may portray above half of private commercial banks assets are in the form of loans and advances. It has standard deviation of 15.4%; which also show there was greater variability than all other asset variables used in the study. The first liability variable, which is the saving deposits (L1), has mean value of 52.6% with standard deviation of 13.4%. Current deposits variable (L2) has mean value of 9.9% with standard deviation of 6.3%. Fixed deposit variable (L3) has mean value of 24% with standard deviation of 7%. And other liability (L4) has a mean value of 13.5% with standard deviation of 6.7%. The mean value and standard deviation of saving deposit and fixed deposit variables are high which probably show that, they are the major source of funds for private commercial banks with greater variability than other liabilities. It is because commercial banks are financial intermediaries which have a simple logic that accept deposits with short and long term maturities from a large number of individuals and grant loans with long term maturities to a small number of borrowers.

The macroeconomic variables incorporated in this study have the mean value of 8.8% and 11.1% with the standard deviation of 4.5% and 12.2% for real growth rate in GDP and the general rate of inflation, respectively. The comparison between minimum and maximum values with the mean value of real growth rate in GDP shows there is lower variability in the variable. Nevertheless, there is greater variability in the general rate of inflation which has large standard deviation in relation to real growth rate in GDP variable. It is especially important to notice that the mean of industry concentration was 0.493, meaning that the industrial concentration level of the banking sector during the analyzed period 2001-2011 was highly concentrated

Generally, from the liability side variables, the saving deposit and fixed deposit variables has significant proportion. While from the asset side variables, loans and advances variable has higher mean value and proportion. This implies that most of the private commercial banks during the study period are financed through saving and fixed deposits and they have used the fund for provision of loans and advances. In relation to standard deviations, deposit with other banks, sum of investments and other liabilities have lower variability, while loans and advances and saving deposits have greater variability, from the assets side and liability side of the balance sheet respectively.

4.2.1.3. Correlation analysis

As could be seen in table 4.5, the loan and advance to average of assets ratio and deposit with other banks to average of assets ratio are positively correlated variables with ROA. This correlation clearly shows that, as the loan and advances and deposit with other banks increase, profitability also moves to the same direction. On the other hand, the saving deposit to average of assets ratio and fixed deposit to average of assets ratio seems to be negatively correlated with the profitability measure, indicating that, when the saving deposit and fixed deposit increase, profitability moves to the opposite direction. Surprisingly, the demand deposit to average of assets ratio and others liabilities to average of assets ratio of banks was positively correlated with ROA, indicated by the correlation of 0.343 and 0.193 respectively between demand deposit, other liabilities to average of assets ratio and ROA. In similar to the saving deposit and fixed deposit, amazingly, the other investments and industry concentration was negatively correlated with profitability with a correlation of -0.189 and -0.378 respectively between other liabilities, industry concentration and ROA. Continuing to the correlations of both macroeconomic variables

used in this study shows a negative and positive correlation with ROA for inflation and gross domestic product respectively.

Table 4.5 Correlation matrix of dependent and independent variables

Correlation Probability	ROA	A1	A2	A3	L1	L2	L3	L4	HHI	INF	GDP										
ROA	1.000																				
A1	0.173	1.000																			
A2	0.164	0.053	0.071	1.000																	
A3	0.672	0.566	0.013	-0.407	1.000																
L1	-0.189	0.127	0.916	0.000	-0.048	0.300	-0.297	0.430	1.000												
L2	0.698	0.014	0.015	0.003	0.343	-0.189	0.288	-0.310	-0.527	1.000											
L3	0.005	0.127	0.018	0.011	0.005	0.127	0.018	0.011	0.000	0.120	1.000										
L4	-0.044	0.436	0.511	-0.446	-0.452	0.120	0.722	0.000	0.000	0.000	0.001	0.336									
HHI	0.193	0.169	0.010	0.209	-0.170	-0.065	0.059	1.000	0.119	0.174	0.935	0.091	0.172	0.601	0.634						
INF	-0.378	0.536	0.172	0.188	0.122	-0.238	0.237	0.081	1.000	0.001	0.000	0.166	0.129	0.327	0.054	0.055	0.514				
GDP	0.199	-0.337	-0.273	-0.268	-0.138	0.198	-0.099	0.024	-0.697	1.000	0.108	0.005	0.026	0.029	0.267	0.110	0.425	0.845	0.000		
	0.554	-0.153	-0.119	-0.208	-0.017	0.177	-0.096	-0.220	-0.595	0.368	1.000	0.000	0.217	0.340	0.092	0.886	0.154	0.442	0.074	0.000	0.002

Source: Financial statements of banks, MoFED reports and own computation

4.2.1.4. Results of regression analysis

This section presents the empirical findings from the econometric results on factors affecting profitability of private commercial bank in Ethiopia. The section covers the empirical regression model used in this study and the results of the regression analysis.

Empirical model: As presented in the third chapter the empirical model used in order to identify factors affecting profitability of private commercial banks using statistical cost accounting model was provided as follows:

$$\text{ROA}_{it} = \alpha_1/\text{TA}_{bt} + \sum \alpha_2 i \text{A}_{ibt}/\text{TA}_{bt} + \sum \alpha_3 j \text{L}_{jbt} / \text{TA}_{bt} + \sum \alpha_4 \text{HHI}_{it} + \sum \alpha_5 \text{INF}_{it} + \sum \alpha_6 \text{GDP}_{it} + u_{bt} \text{ --- (3)}$$

The estimation result of the operational panel regression model used in this study is presented in table 4.6. From table 4.6 the R-squared statistics and the adjusted-R squared statistics of the model was 66% and 60% respectively. The result indicates that the changes in the independent variables explain 60% of the changes in the dependent variable. That is loan and advance, deposit with other bank, sum of investment, saving deposit, demand deposit, fixed deposit, other liabilities, industry concentration, gross domestic product, and inflation rate collectively explain 60% of the changes in ROA. The remaining 40% of changes was explained by other factors which are not included in the model. Thus these variables collectively, are good explanatory variables of the profitability of private commercial banks in Ethiopia. The null hypothesis of F-statistic (the overall test of significance) that the R-square is equal to zero was rejected at 1% as the p-value was sufficiently low. F value of 0.000 indicates strong statistical significance, which enhanced the reliability and validity of the model.

Based on the results shown in table 4.6, all bank-specific independent variables except deposit with other bank to average of assets, sum of investments to average of assets and saving deposit to average of assets are statistically significant impact on profitability. On the other hand, among the three external independent variables used in this study industry concentration and gross domestic product are significant. Among the significant variables, loan and advance to average of assets, fixed deposit to average of assets, industry

concentration and gross domestic product were significant at 1% significance level since the p-value for both variables were 0.000. Whereas variables like demand deposit to average of assets and other liabilities to average of assets were significant at 5% significance level since the p-value was 0.0349 and 0.0121 respectively.

Table 4.6 Regression Results for factors affecting profitability of private commercial banks.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012917	0.016712	0.772943	0.4429
A1	0.059973	0.014835	4.042766	0.0002***
A2	0.031095	0.024313	1.278959	0.2063
A3	-0.028262	0.025434	-1.111209	0.2713
L1	-0.013633	0.017583	-0.775348	0.4415
L2	0.049344	0.022818	2.162501	0.0349**
L3	-0.100170	0.036165	-2.769843	0.0076***
L4	0.057415	0.022121	2.595511	0.0121**
HHI	-0.054343	0.020022	-2.714112	0.0089***
INF	-0.016251	0.015280	-1.063546	0.2922
GDP	0.135614	0.034177	3.967998	0.0002***
R-squared	0.660109	Durbin-Watson stat 1.231878		
Adjusted R-squared	0.598311			
S.E. of regression	0.009354			
F-statistic	10.68168			
Prob(F-statistic)	0.000000			

***, **, and * denote significance at 1%, 5%, and 10% levels respectively.

Source: Financial statements of banks, MoFED reports and own computation

Besides, table 4.6 also shows that the coefficient of sum of investment to average of assets, saving deposit to average of assets, fixed deposit to average of assets, industry concentration and inflation against ROA were negative as far as the coefficients for those variables are negative -0.028, -0.013, -0.100, -0.054 and -0.016 respectively. This indicates that there was an inverse relationship between the aforementioned five independent variables and ROA. Thus the increase of those variables will lead to a decrease in ROA.

On the other hand, variables like loan and advance to average of assets, deposit with other banks to average of assets, demand deposit to average of assets, other liabilities to average of assets, and gross domestic product had a positive relationship with profitability as far as their respective coefficients were 0.059, 0.031, 0.049, 0.057 & 0.135. This revealed that there was a direct relationship between the above five independent variables and ROA. In general as per the regression results provided in table 4.6 among the 10 regressors used in this study six of them were significant.

In general, so far, the results of the documentary analysis which includes tests for the classical linear regression model, descriptive statistics, correlation matrix & regression analysis have been presented. The results of the tests for the classical linear regression model showed as the data fit the basic assumptions of CLRMs.

4.3. Discussions of the Results

The preceding sections presented the result of the documentary analysis. The purpose of this section is to discuss the results obtained from data sources. The analysis is based on the results of the documentary analysis using the results of the regression analysis between the dependent variable and the independent variables presented in table 4.6 presented in the preceding section.

According to Table 4.6 shows the results of regressions that use ROA as a dependent variable for private commercial banks'. Accordingly, the intercept has positive and statistically insignificant impact on profitability. It can be explained as during the study period private commercial banks earn a positive income flows unrelated to the balance sheet items.

4.3.1. Loan and advance (A1)

The coefficient of loan and advance which is measured by the loan and advance to average of asset ratio was positive and statistically significant at 1% significance level ($p\text{-value}=0$) and verify the hypotheses that assets of the bank are positively related to banks' profitability. The coefficient of loan and advance to average of assets was relatively higher as compared to other variables shows that an increase in loan and advance will result in increased profitability. Loan interest is a very good source of income to bank hence, the higher the loan portfolio the higher the interest margin and profit. So from the findings we can conclude as loan and advance was one of the main factors which significantly affect the profitability of private commercial banks' in Ethiopia. Further, the finding was consistent with previous studies of Kwast & Rose (1982), Vasiliou (1996), Hester & Zoellner (1966) and Asiri (2007) their study found that assets are positively related to banks profitability.

4.3.2. Deposit with other banks (A2)

The coefficient of deposit with other banks which is measured by the deposit with other banks to average of assets ratio was positive but statistically insignificant ($p\text{-value}=0.2063$) and verify the hypotheses that assets of the bank are positively related to banks' profitability. It can be interpreted as; one birr increase in the amount of deposit with other banks (A2) would generate 0.031 cents increase on profitability private commercial banks. The finding was also consistent with previous studies of Hester & Zoellner (1966), Kwast & Rose (1982), Vasiliou (1996) and Asiri (2007) their studies found that assets are positively related to banks profitability.

4.3.3. Sum of investments (A3)

Unlike, the coefficient of loan and advance and deposit with other banks the coefficient of sum of investment was negative and statistically insignificant ($p\text{-value}=0.2713$) and the

data don't support the hypotheses that assets of the bank are positively related to banks' profitability. Sum of investments are assets that generate return from short-term investment and other investments. Thus, it is normal to expect direct relationship with profitability. But, the regression result fails to support this conjecture indicating that for each birr added on sum of investments (A3) would generate 0.028 cents decrease on profitability private commercial banks. This variable is in contrast to previous studies of Hester & Zoellner (1966), Kwast & Rose (1982), Vasiliou (1996) and Asiri (2007) their studies found that assets are positively related to banks profitability.

4.3.4. Saving deposit (L1)

The coefficient of saving deposit which is measured by the saving deposit to average of assets ratio was negative and statistically insignificant ($p\text{-value}=0.4415$) and the variable verify the hypotheses that liabilities of the bank are negatively related to banks' profitability. It can be opened without any introduction. Money can be deposited at any time but, there is a restriction on the amount that can be withdrawn at a particular time or during a week. If the customer wishes to withdraw more than the specified amount at any one time, he has to give prior notice. Interest is allowed on the credit balance of this account. The rate of interest is greater than the rate of interest on the current deposits and less than that on fixed deposit. This system greatly encourages the habit of thrift or savings. The findings also suggested that saving deposit is not a determinant of banks' profitability in private commercial banks' in Ethiopia as far as the parameter for this variable is insignificant as illustrated by the large $p\text{-values}$ of 0.4415. And the finding was consistent with previous studies of Hester & Zoellner (1966), Kwast & Rose (1982), Vasiliou (1996) and Asiri (2007) their study found that liabilities are negatively related to banks profitability.

4.3.5. Demand deposit (L2)

Unlike, the coefficient of saving deposit the coefficient of demand deposit to average of assets was positive and statistically significant at 5% significance level ($p\text{-value}=0.0349$) and the data do not support the hypotheses that liabilities of the bank are negatively related to banks' profitability. These deposits can be withdrawn at any time. Generally, no interest is allowed on current deposits, and in case, the customer is required to leave a minimum balance undrawn with the bank. Cheques are used to withdraw the amount. These deposits are kept by businessmen and industrialists who receive and make large payments through banks. The bank levies certain incidental charges on the customer for the services rendered by it. So from the findings we can conclude as demand deposit was one of the factors affecting of profitability of private commercial banks' in Ethiopia. And the finding was contrast with previous studies of Hester & Zoellner (1966), Kwast & Rose (1982), Vasiliou (1996) and Asiri (2007) their study found that liabilities are negatively related to banks profitability.

4.3.6. Fixed deposit (L3)

The coefficient of fixed deposit which is measured by the fixed deposit to average of assets ratio was negative and statistically significant at 1% significance level ($p\text{-value}=0.0076$) and the variable verify the hypotheses that the liabilities of the bank are negatively related to banks' profitability. These deposits cannot be withdrawn before the expiry of the period for which they are deposited or without giving a prior notice for withdrawal. If the depositor is in need of money, he has to borrow on the security of this account and pay a slightly higher rate of interest to the bank. They are attracted by the payment of interest which is usually higher for longer period. Fixed deposits are liked by depositors both for their safety and as well as for their interest. So from the findings we can conclude as fixed

deposits was one of the main determinants of profitability of private commercial banks' in Ethiopia. And the finding was consistent with previous studies of Hester & Zoellner (1966), Kwast & Rose (1982), Vasiliou (1996) and Asiri (2007) their study found that liabilities are negatively related to banks profitability.

4.3.7. Other liabilities (L4)

The coefficient of other liabilities which is measured by the other liabilities to average of assets ratio was positive and statistically significant at 5% significance level (p-value=0.0121) and the data do not support the hypotheses that, liabilities of the bank are negatively related to banks' profitability. Surprisingly, the coefficient of other liabilities is positive and it may be argued that these banks pay only nominal interest on this liabilities but charge high service fees. And the finding was contrast with previous studies of Hester & Zoellner (1966), Kwast & Rose (1982), Vasiliou (1996) and Asiri (2007) their study found that liabilities are negatively related to banks profitability.

4.3.8. Industry concentration (HHI)

Continuing to the industry-specific variable, the coefficient of the only industry specific variable used in this study concentration is negative and statistically significant at 1% significance level (p-value=0.0089) and the data don't support the hypotheses that the market concentration is positively related to profitability. Hence, this study finds no evidence to support the SCP hypothesis. The structure-conduct-performance hypothesis (also referred to as the market-power hypothesis) states that a more concentrated sector favors bank profitability motivated by the benefits of greater market power. Thus, industry concentration is main factor that affect private commercial banks profitability as indicated by the significant coefficient in the regression analysis output. The finding is consistent with the findings of Athanasoglou et al. (2008), Damena (2011) and Molla (2012).

4.3.9. Inflation (INFL)

Inflation affects banks profitability through different channels and its impact on profitability can be positive or negative. If the inflation is not anticipated, the banks may be slow in adjusting their interest rates and this adversely or negatively affects bank profitability. On the other hand, if the inflation is anticipated, banks may get an opportunity to adjust their interest rates accordingly and resulted with revenues that increased faster than costs. Despite this fact, the coefficient estimate of inflation in this particular study revealed a negative association with the profitability of private commercial banks' in Ethiopian. This implies the existence of inverse relationship among inflation and profitability of private commercial banks. However, this negative association was not statistically significant; thus, the findings suggested that inflation was not a major factor that determine the profitability of private commercial banks of Ethiopia as far as the parameter for this variable is insignificant as illustrated by a p-values of 0.2922. This is because of the existence of a lower real interest rate which is obviously lower than the real inflationary rate, resulting in costs increased faster than revenues. In Ethiopia the maximum lending rate is determined by National bank of Ethiopia and banks are unable to adjust their lending rate in accordance with inflation rate. For instance, the average annual inflation rate in Ethiopia over the period of consideration was 11% with a maximum of 36.4%. Despite this fact, the average lending rate never exceeds 12.75% over the sample period. This clearly indicates the lending rate in Ethiopia was far below from the market interest rate. In conclusion the result clearly reveals as private commercial banks profitability is not influenced by inflation.

4.3.10 Gross domestic product (GDP)

The coefficient estimate of real GDP growth revealed a positive and statistically significant association with the profitability of private commercial banks at 1% significance level (p-value of =0.0002). The magnitude of the coefficient estimate (0.1356) indicates the existence of strong positive relationship between real GDP growth and profitability of private commercial banks. The findings was in accordance with prior expectation and theory that suggested whenever there was a positive GDP growth, the economic activities in general were increasing and the volume of cash held for either businesses or households was increasing. These conditions contributed to decrease the likelihood that borrowers delay their financial obligations. In addition, strong positive growth in real GDP creates a new and potential demand for financial services that can easily translates into more income. Hence, it can be concluded that, the existing ever increasing economic growth in Ethiopia over the sampled period creates a new and potential demand for financial services and ultimately increase the profitability of private commercial banks. The findings suggested that, real GDP growth was one of the vital determinants of profitability private commercial banks. This result was consistent with the findings of Pasiouras & Kosmidou (2007), Abera (2012) and Ponce (2012).

Chapter Five: Conclusions and Recommendations

The preceding chapter presented the analysis of the findings, while this chapter deals with the conclusions and recommendations based on the findings of the study. Accordingly this chapter is organized into two sub-sections. Section 5.1 presents the conclusions and section 5.2 presents the recommendations.

5.1. Conclusions

The main objective of this study was to assess factors affecting profitability of private commercial banks in Ethiopia using statistical cost accounting model. By considering the nature and objective of the research, a quantitative research approach was adopted. To collect the necessary data the study used survey of documents (structured review of financial records). The collected data from a sample size of six private commercial banks over the period of 2001 to 2011 were analyzed using descriptive statistics, correlation matrix and multiple linear regression analysis. The analyses were made in accordance to the stated hypotheses formulated in the study.

In order to conduct the empirical analysis, one dependent variable (profitability measured by ROA), and ten independent variables were selected; loan and advance, deposit with other banks, sum of investments, saving deposit, current deposit, fixed deposit, other liabilities, market concentration, gross domestic product and inflation. The variables were selected by refereeing different theories and empirical studies that have been conducted on banks profitability and asset liability management. Consequently, the empirical findings of this particular study suggested the following conclusions:

First, the coefficient of the constant term is positive and statistically insignificant. The positive coefficient of constant term which represents economies of scale suggests that private commercial banks in Ethiopia during the study period earn net positive income from

off-balance sheet activities. That means that these banks enjoy increasing returns to scale in their operation.

Second, the empirical findings of this study provide evidence that the profitability of private commercial banks in Ethiopia is positively affected by assets management, except for sum of investments. Specifically, the loans and advances have significant effect on the profitability of private commercial banks. All other asset variables have no significant effect on private commercial banks profitability. This implies that they cannot be able to generate income from alternative sources. Particularly, the other investment activities are not important as in the case of other countries. Although the other asset variables are not able to generate income for private commercial banks, loans and advances are making significant contributions toward profitability.

Third, all liabilities are negatively related to profitability except for demand deposit and other liabilities. Surprisingly, the coefficient of other liabilities is positive and it may be argued that these banks pay only nominal interest on this liabilities but charge high service fees. The demand deposits variable has positive and significant effect on profitability of private commercial banks. That is because private commercial banks are receiving better service charges on demand deposits that can cover the liquidity requirement costs on its off-balance sheet activities. From the liability variables the fixed deposits variable significantly cost the profitability of private commercial banks.

Fourth, Market concentration ratio represented by Herfindahl index has a negative sign indicating that higher concentration in the market decreases the profitability of private commercial banks. This is against the structure-conduct-performance (SCP) hypothesis that market concentration positively impact bank profitability.

Lastly, the macroeconomic variables incorporated in this study model were the general rate of inflation and real growth rate in GDP. The GDP growth has statistically significant and positive relationship with profitability. On the other hand, inflation has no impact on the profitability of private commercial banks in this model as far the variable is not significant even at 10% significance level. In general, assets management, mainly loans and advances, contributes positively for the profitability of private commercial banks, except sum of investments. While liability management, particularly saving and fixed deposits, cost negatively the profitability of private commercial banks in Ethiopia.

5.2. Recommendations

In line with the findings of the study, the following recommendations have been forwarded. From the results obtained from the regression analysis the result suggested that, among balance sheet variables loan and advance and fixed deposit was the major factor that can positively and negatively contribute to the profitability of private commercial banks in Ethiopia. Therefore, private commercial banks should focus on increasing public awareness to mobilize more savings; this will enhance their performance in provision of loans and advance to customers.

Additionally, private commercial banks should not only be concerned about internal structures and policies, but they must consider both the internal environment and the macroeconomic environment together in fashioning out strategies to improve their profitability.

Finally, the study sought to investigate factors affecting profitability of private commercial banks in Ethiopia. For comprehensive investigation future researcher could increase the number of observations by increasing the sample size and extending the period of time with unbalanced data. In addition, future research could cover cross countries to capture countries differences and to uncover difference from financial system and regulation factors.

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APPENDICES

Appendices

Appendix –I: Tests for the Heteroscedasticity Test: White

Heteroskedasticity Test: White

F-statistic	29.57141	Prob. F(64,1)	0.1453
Obs*R-squared	65.96515	Prob. Chi-Square(64)	0.4087
Scaled explained SS	49.07627	Prob. Chi-Square(64)	0.9159

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 12/31/13 Time: 16:06

Sample: 1 66

Included observations: 66

Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.044048	0.007011	-6.282454	0.1005
A1	-0.028690	0.004975	-5.766966	0.1093
A1^2	-0.002401	0.003135	-0.765923	0.5839
A1*A2	0.006452	0.007689	0.839158	0.5555
A1*A3	0.007653	0.007472	1.024196	0.4924
A1*L1	0.018157	0.003450	5.262722	0.1195
A1*L2	0.031966	0.007252	4.407697	0.1420
A1*L3	0.020023	0.011632	1.721373	0.3350
A1*L4	0.043478	0.008942	4.862134	0.1291
A1*HHI	0.002237	0.003777	0.592309	0.6596
A1*INF	-0.040711	0.008004	-5.086282	0.1236
A1*GDP	0.093035	0.023861	3.898962	0.1598
A2	0.077147	0.017922	4.304727	0.1453
A2^2	0.018163	0.005169	3.513856	0.1765
A2*A3	-0.011771	0.019713	-0.597090	0.6573
A2*L1	-0.065476	0.017196	-3.807713	0.1635
A2*L2	-0.056731	0.014549	-3.899388	0.1598
A2*L3	-0.150331	0.034886	-4.309221	0.1452
A2*L4	-0.088453	0.018317	-4.828971	0.1300
A2*HHI	-0.025327	0.012403	-2.041975	0.2899
A2*INF	2.34E-05	0.005001	0.004671	0.9970
A2*GDP	0.002821	0.020500	0.137624	0.9129
A3	0.087192	0.017450	4.996796	0.1257
A3^2	-0.002904	0.008754	-0.331762	0.7961
A3*L1	-0.079051	0.020408	-3.873485	0.1608
A3*L2	-0.097843	0.022048	-4.437743	0.1411
A3*L3	-0.135944	0.033485	-4.059889	0.1537
A3*L4	-0.026064	0.010531	-2.474919	0.2445

A3*HHI	-0.015370	0.007793	-1.972348	0.2987
A3*INF	0.002708	0.005341	0.507042	0.7013
A3*GDP	-0.018599	0.013062	-1.423839	0.3898
L1	0.063520	0.009583	6.628116	0.0953
L1^2	-0.003674	0.003618	-1.015409	0.4951
L1*L2	0.010878	0.011938	0.911228	0.5295
L1*L3	-0.033731	0.008903	-3.788727	0.1643
L1*L4	-0.099032	0.014428	-6.864028	0.0921
L1*HHI	-0.054665	0.008252	-6.624685	0.0954
L1*INF	-0.027133	0.008194	-3.311388	0.1867
L1*GDP	-0.089174	0.023848	-3.739323	0.1664
L2	-0.004602	0.008475	-0.542991	0.6833
L2^2	0.039034	0.010282	3.796208	0.1640
L2*L3	-0.049771	0.021148	-2.353488	0.2558
L2*L4	-0.012784	0.020186	-0.633293	0.6406
L2*HHI	-0.022902	0.010177	-2.250342	0.2662
L2*INF	-0.006882	0.005325	-1.292304	0.4193
L2*GDP	-0.069576	0.016529	-4.209309	0.1485
L3	0.105199	0.015872	6.627841	0.0953
L3^2	0.053093	0.013889	3.822616	0.1629
L3*L4	-0.167685	0.029445	-5.694913	0.1107
L3*HHI	-0.061623	0.026139	-2.357500	0.2554
L3*INF	-0.019066	0.011228	-1.698075	0.3388
L3*GDP	-0.121446	0.021913	-5.542182	0.1136
L4	0.105292	0.015715	6.700246	0.0943
L4^2	-0.060520	0.009773	-6.192624	0.1019
L4*HHI	-0.019596	0.006821	-2.872679	0.2133
L4*INF	0.001937	0.005542	0.349458	0.7860
L4*GDP	-0.158378	0.027785	-5.700175	0.1106
HHI	0.007063	0.005336	1.323512	0.4119
HHI^2	0.061222	0.009538	6.419026	0.0984
HHI*INF	0.244013	0.040961	5.957191	0.1059
HHI*GDP	-0.301338	0.072158	-4.176091	0.1496
INF	-0.101222	0.020501	-4.937522	0.1272
INF^2	0.083520	0.014544	5.742767	0.1098
INF*GDP	0.211249	0.038404	5.500714	0.1145
GDP	0.207604	0.047677	4.354404	0.1437

R-squared	0.999472	Mean dependent var	7.29E-05
Adjusted R-squared	0.965673	S.D. dependent var	0.000108
S.E. of regression	1.99E-05	Akaike info criterion	-21.02905
Sum squared resid	3.97E-10	Schwarz criterion	-18.87257
Log likelihood	758.9587	Hannan-Quinn criter.	-20.17692
F-statistic	29.57141	Durbin-Watson stat	2.925556
Prob(F-statistic)	0.145321		

Appendix –II: Model specification error (linearity) test: Ramsey RESET Test

Ho: The models functional form is appropriate

Ha: The models functional form is inappropriate

Ramsey RESET Test:

F-statistic	2.107687	Prob. F(1,54)	0.1523
Log likelihood ratio	2.527059	Prob. Chi-Square(1)	0.1119

Test Equation:

Dependent Variable: ROA

Method: Least Squares

Date: 12/31/13 Time: 16:00

Sample: 1 66

Included observations: 66

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.013490	0.016551	0.815083	0.4186
A1	0.114259	0.040173	2.844134	0.0063
A2	0.058034	0.030393	1.909425	0.0615
A3	-0.047576	0.028480	-1.670523	0.1006
L1	-0.030611	0.020972	-1.459616	0.1502
L2	0.095374	0.038931	2.449803	0.0176
L3	-0.188632	0.070675	-2.669023	0.0100
L4	0.099111	0.036118	2.744062	0.0082
HHI	-0.102813	0.038828	-2.647895	0.0106
INF	-0.033375	0.019183	-1.739816	0.0876
GDP	0.239727	0.079296	3.023199	0.0038
FITTED^2	-11.79979	8.127770	-1.451787	0.1523

R-squared	0.672877	Mean dependent var	0.039618
Adjusted R-squared	0.606241	S.D. dependent var	0.014759
S.E. of regression	0.009261	Akaike info criterion	-6.362997
Sum squared resid	0.004632	Schwarz criterion	-5.964878
Log likelihood	221.9789	Hannan-Quinn criter.	-6.205682
F-statistic	10.09779	Durbin-Watson stat	1.250755
Prob(F-statistic)	0.000000		

Appendix –III: Regression Results

Dependent Variable: ROA
Method: Panel Least Squares
Date: 12/06/13 Time: 14:32
Sample: 2001 2011
Periods included: 11
Cross-sections included: 6
Total panel (balanced) observations: 66

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012917	0.016712	0.772944	0.4429
A1	0.059973	0.014835	4.042767	0.0002
A2	0.031095	0.024313	1.278960	0.2063
A3	-0.028262	0.025434	-1.111208	0.2713
L1	-0.013633	0.017583	-0.775348	0.4415
L2	0.049344	0.022818	2.162500	0.0349
L3	-0.100170	0.036165	-2.769843	0.0076
L4	0.057415	0.022121	2.595511	0.0121
HHI	-0.054343	0.020022	-2.714113	0.0089
INF	-0.016251	0.015280	-1.063546	0.2922
GDP	0.135614	0.034177	3.967997	0.0002
R-squared	0.660109	Mean dependent var	0.039618	
Adjusted R-squared	0.598311	S.D. dependent var	0.014759	
S.E. of regression	0.009354	Akaike info criterion	-6.355012	
Sum squared resid	0.004812	Schwarz criterion	-5.990069	
Log likelihood	220.7154	Hannan-Quinn criter.	-6.210805	
F-statistic	10.68168	Durbin-Watson stat	1.231878	
Prob(F-statistic)	0.000000			

Appendix IV: Ratio Data

Bank	ROA	A1	A2	A3	L1	L2	L3	L4	HHI	INF	GDP
AIB	0.021609	0.65066	0.132053	0.091236	0.662665	0.163265	0.07563	0.051621	0.694027	-0.003	0.074
AIB	0.018821	0.631005	0.071322	0.186231	0.70629	0.164438	0.05052	0.05052	0.644499	-0.106	0.016
AIB	0.014326	0.636689	0.081178	0.277756	0.696379	0.194986	0.035018	0.079586	0.595602	0.109	-0.021
AIB	0.022075	0.596657	0.073163	0.252917	0.719647	0.181015	0.040997	0.076947	0.560964	0.073	0.117
AIB	0.027528	0.645646	0.134635	0.155155	0.719219	0.211211	0.040541	0.029029	0.5055	0.061	0.126
AIB	0.042857	0.72278	0.142471	0.136293	0.707722	0.221622	0.061776	0.032046	0.466672	0.106	0.115
AIB	0.060142	0.740566	0.125884	0.058667	0.655366	0.177771	0.084316	0.083726	0.43256	0.158	0.118
AIB	0.047168	0.633064	0.123237	0.084162	0.645549	0.190751	0.058497	0.081618	0.39945	0.253	0.112
AIB	0.03593	0.482568	0.166667	0.093383	0.649057	0.20153	0.032195	0.248844	0.361008	0.364	0.099
AIB	0.048859	0.437918	0.130429	0.205735	0.648803	0.192511	0.00863	0.27255	0.357007	0.028	0.104
AIB	0.055922	0.441504	0.139306	0.04208	0.625436	0.223023	0.0091	0.222579	0.414927	0.181	0.114
BOA	0.065177	1.24581	0.195531	0.068901	0.871508	0.175047	0.165736	0.182495	0.694027	-0.003	0.074
BOA	0.007851	0.619235	0.330716	0.061825	0.619235	0.131501	0.141315	0.090285	0.644499	-0.106	0.016
BOA	0.006465	0.603636	0.309495	0.053333	0.58101	0.167273	0.121212	0.16	0.595602	0.109	-0.021
BOA	0.037012	0.609321	0.200822	0.152159	0.642221	0.152844	0.078821	0.126114	0.560964	0.073	0.117
BOA	0.04503	0.644152	0.114772	0.049423	0.649643	0.182867	0.060956	0.09665	0.5055	0.061	0.126
BOA	0.049888	0.777755	0.085054	0.046207	0.632999	0.164792	0.092415	0.104273	0.466672	0.106	0.115
BOA	0.030498	0.705297	0.083788	0.107865	0.60931	0.164045	0.100161	0.087319	0.43256	0.158	0.118
BOA	0.00574	0.06971	0.077485	0.050874	0.062927	0.204936	0.073316	0.097052	0.39945	0.253	0.112
BOA	0.029958	0.501282	0.08023	0.05335	0.625834	0.248551	0.047836	0.095004	0.361008	0.364	0.099
BOA	0.033342	0.498256	0.118227	0.054606	0.643532	0.207366	0.023135	0.094412	0.357007	0.028	0.104
BOA	0.038059	0.472784	0.115209	0.040271	0.652456	0.23475	0.009002	0.079953	0.414927	0.181	0.114
DB	0.036641	0.703308	0.222901	0.038677	0.542494	0.265649	0.093639	0.123155	0.694027	-0.003	0.074
DB	0.030162	0.653519	0.170147	0.185615	0.569992	0.303944	0.047177	0.133797	0.644499	-0.106	0.016
DB	0.021283	0.700604	0.160483	0.130572	0.60742	0.268047	0.056946	0.138625	0.595602	0.109	-0.021
DB	0.033419	0.697087	0.11611	0.187661	0.620394	0.266924	0.045844	0.140103	0.560964	0.073	0.117

DB	0.031819	0.708545	0.170904	0.06331	0.622273	0.260128	0.046908	0.112842	0.5055	0.061	0.126
DB	0.046447	0.773286	0.137334	0.064524	0.58825	0.260859	0.077831	0.117499	0.466672	0.106	0.115
DB	0.048739	0.734675	0.124681	0.072542	0.537074	0.257108	0.124114	0.120147	0.43256	0.158	0.118
DB	0.048017	0.617304	0.126172	0.077722	0.554001	0.233165	0.099928	0.136554	0.39945	0.253	0.112
DB	0.040087	0.495388	0.101469	0.065027	0.573283	0.249402	0.079945	0.10238	0.361008	0.364	0.099
DB	0.041474	0.447252	0.230191	0.180567	0.609436	0.249117	0.063298	0.098252	0.357007	0.028	0.104
DB	0.046642	0.451173	0.185089	0.158881	0.57733	0.252318	0.047066	0.105279	0.414927	0.181	0.114
NIB	0.072874	0.850202	0.218623	0.125506	0.493927	0.246964	0.101215	0.242915	0.694027	-0.003	0.074
NIB	0.050575	0.744828	0.278161	0.096552	0.466667	0.218391	0.108046	0.206897	0.644499	-0.106	0.016
NIB	0.026779	0.775194	0.15081	0.193094	0.473573	0.214235	0.140944	0.427061	0.595602	0.109	-0.021
NIB	0.045966	0.737336	0.106004	0.218574	0.462477	0.214822	0.103189	0.366792	0.560964	0.073	0.117
NIB	0.04431	0.760658	0.153072	0.115475	0.475999	0.196039	0.149043	0.191339	0.5055	0.061	0.126
NIB	0.043097	0.784783	0.122905	0.076084	0.445331	0.173982	0.153232	0.154296	0.466672	0.106	0.115
NIB	0.045749	0.784204	0.11653	0.049202	0.468278	0.182564	0.160121	0.130773	0.43256	0.158	0.118
NIB	0.050823	0.675723	0.086719	0.077034	0.459326	0.21448	0.11571	0.186032	0.39945	0.253	0.112
NIB	0.051785	0.524947	0.09507	0.070466	0.471979	0.244029	0.063608	0.184677	0.361008	0.364	0.099
NIB	0.052886	0.472444	0.18817	0.163852	0.467063	0.242902	0.055855	0.172017	0.357007	0.028	0.104
NIB	0.052587	0.422992	0.199278	0.057479	0.479554	0.275472	0.033326	0.11985	0.414927	0.181	0.114
UB	0.044818	0.745098	0.168067	0.028011	0.498599	0.156863	0.067227	0.123249	0.694027	-0.003	0.074
UB	0.026515	0.609848	0.223485	0.106061	0.431818	0.159091	0.125	0.140152	0.644499	-0.106	0.016
UB	0.01788	0.722861	0.212005	0.010217	0.439336	0.153257	0.140485	0.232439	0.595602	0.109	-0.021
UB	0.017498	0.645669	0.365704	0.010499	0.48294	0.206474	0.24147	0.08049	0.560964	0.073	0.117
UB	0.049227	0.652547	0.34917	0.009159	0.454493	0.218661	0.317115	0.09502	0.5055	0.061	0.126
UB	0.04491	0.72979	0.178892	0.012725	0.509731	0.247754	0.155689	0.140719	0.466672	0.106	0.115
UB	0.046007	0.723427	0.264939	0.013221	0.448969	0.203596	0.162348	0.149127	0.43256	0.158	0.118
UB	0.046383	0.666299	0.23714	0.007362	0.502117	0.248113	0.149089	0.124793	0.39945	0.253	0.112
UB	0.033915	0.527968	0.201145	0.009618	0.502151	0.279929	0.132878	0.130853	0.361008	0.364	0.099
UB	0.047019	0.477391	0.230392	0.011565	0.541663	0.284766	0.06939	0.101242	0.357007	0.028	0.104
UB	0.04742	0.467738	0.223865	0.016883	0.528224	0.300081	0.062101	0.111282	0.414927	0.181	0.114

WB	0.025524	0.599818	0.151322	0.06381	0.422972	0.289881	0.105743	0.13856	0.69403	-0.003	0.074
WB	0.019528	0.628153	0.15297	0.029292	0.328723	0.279902	0.222945	0.109032	0.6445	-0.106	0.016
WB	0.019544	0.706189	0.225407	0.023453	0.357003	0.327036	0.233225	0.11987	0.5956	0.109	-0.021
WB	0.044357	0.685067	0.235584	0.019714	0.345983	0.36964	0.147856	0.13307	0.56096	0.073	0.117
WB	0.045718	0.690131	0.329463	0.017417	0.375907	0.428157	0.130624	0.107402	0.5055	0.061	0.126
WB	0.048516	0.782452	0.174968	0.029419	0.373161	0.374194	0.170323	0.116645	0.46667	0.106	0.115
WB	0.053319	0.717895	0.287855	0.023349	0.280014	0.421502	0.247604	0.123018	0.43256	0.158	0.118
WB	0.049967	0.580671	0.194632	0.019198	0.287968	0.313215	0.17883	0.145431	0.39945	0.253	0.112
WB	0.055393	0.429298	0.152412	0.034837	0.328465	0.404631	0.073569	0.119874	0.36101	0.364	0.099
WB	0.058564	0.437569	0.281726	0.082505	0.360958	0.326151	0.035359	0.141252	0.35701	0.028	0.104
WB	0.066362	0.402521	0.223827	0.018257	0.366442	0.451641	0.045063	0.11099	0.41493	0.181	0.114

